ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U.S.

JAN 27 1945

USDA

McGraw-Hill Co. of California

JANUARY 1945

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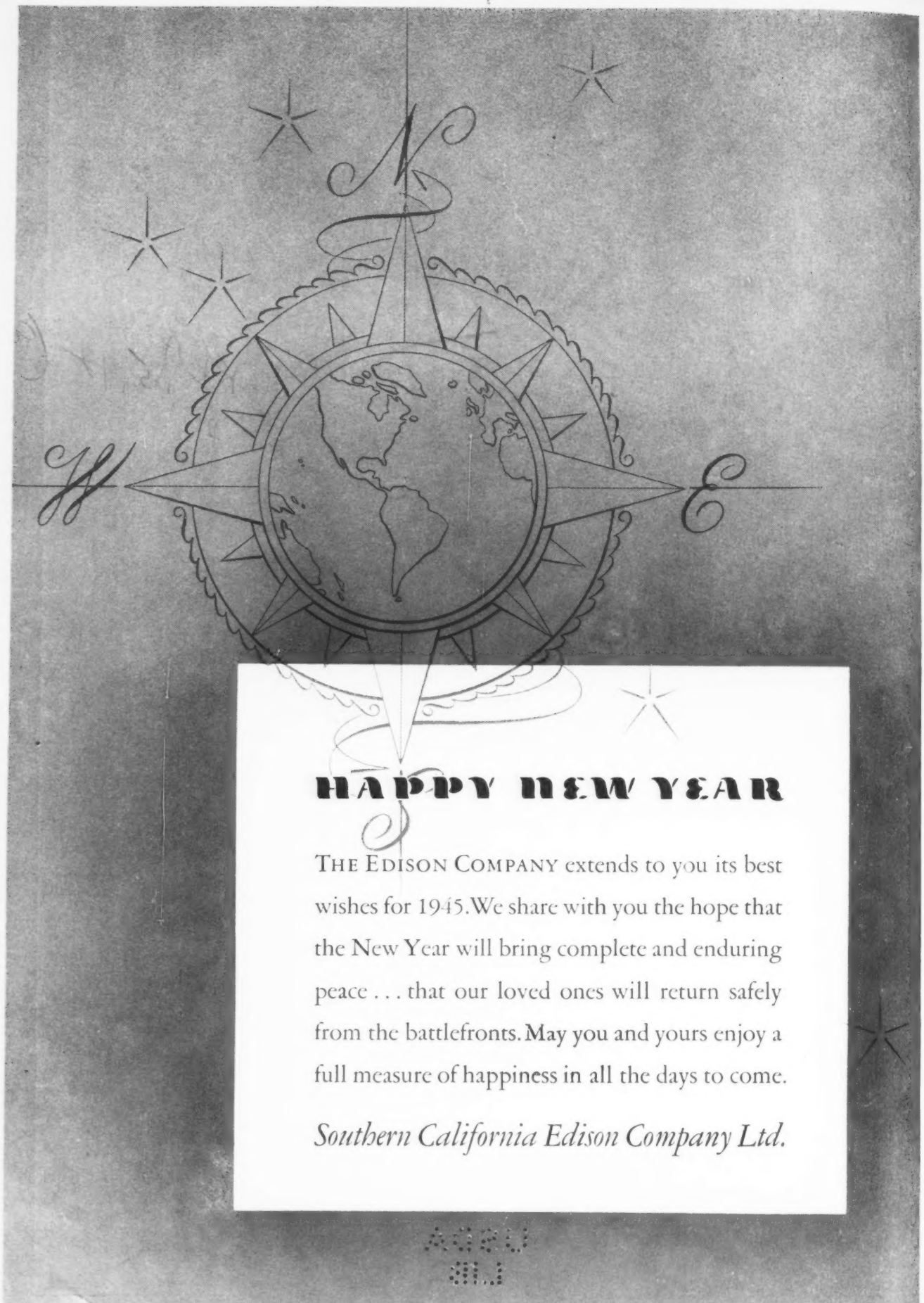
N
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E
HAPPY NEW YEAR
THE EDISON COMPANY extends to you its best wishes for 1945. We share with you the hope that the New Year will bring complete and enduring peace . . . that our loved ones will return safely from the battlefronts. May you and yours enjoy a full measure of happiness in all the days to come.
Southern California Edison Company Ltd.

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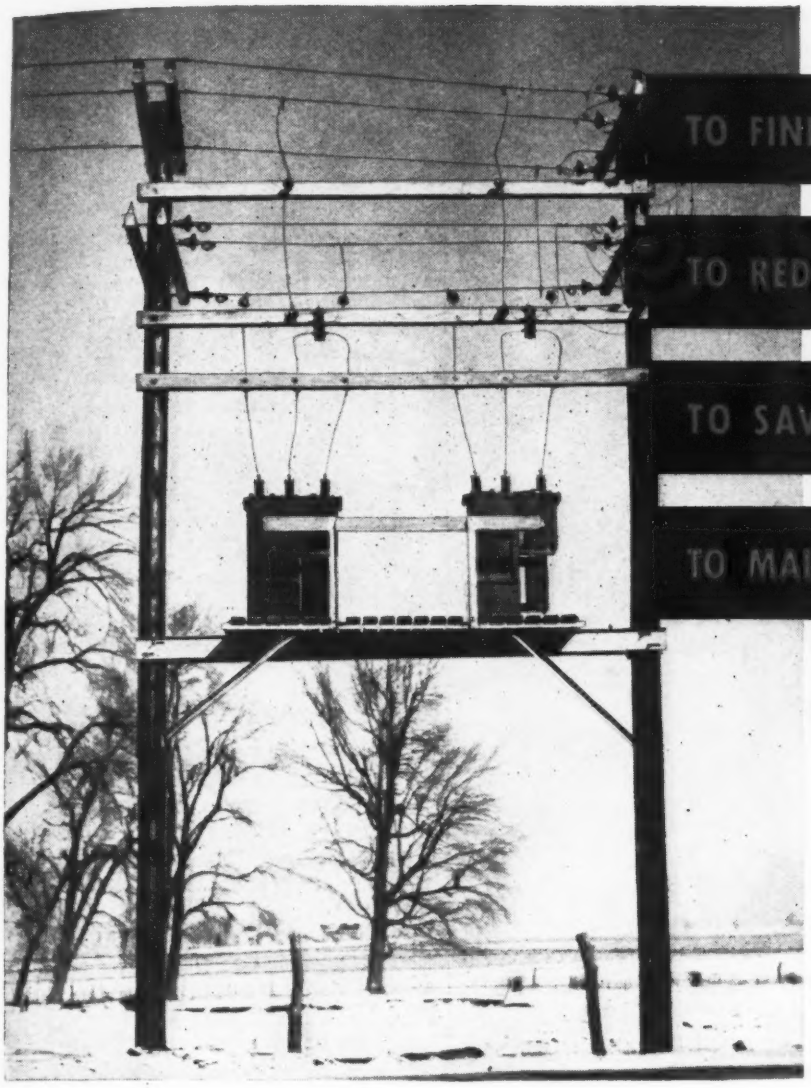

Your best bet for rural circuits—Low-cost ML-4 step voltage regulators, like these, usually represent the most economical method of voltage regulation on rural circuits. Hundreds of such installations, made during the past few years, have proved their effectiveness. They help get full voltage, improve appliance performance and life, increase consumer good will, and build load.

Keep the Voltage UP with Regulators

OBVIOUSLY, you will find it a lot easier to handle the distribution problems that arise from war loads, one or two shifts instead of three, and reconversion, if you can get the voltage up and hold it there.

Feeder voltage regulators are *made* for this job. The investment is small when compared with other voltage-improvement methods; little construction material and relatively few man-hours are required for installation. They are a "natural" for voltage problems that must be solved in a matter of weeks, not months.

Remember, too, aside from the improved service they make possible, that "there's revenue in regulators." They are still near the top of the list of good self-liquidating investments. Actual case histories indicate annual savings of from $834 to $9950 *on a single feeder*.

A wide range of G-E feeder voltage regulators can be obtained promptly from stock—for automatic control on circuits from 120 to 69,000 volts. Induction and step types—in oil-filled, Pyranol, and dry-type designs—permit choice of a regulator exactly suited to your needs. For complete listing information, ask for Bulletin GEA-4276. *General Electric Company, Schenectady 5, N. Y.*

Buy all the BONDS you can—and keep all you buy

GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 94 JANUARY, 1945 NO. 1

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Cover photo: The spotlight is on the tool, to permit more accurate machining of parts for war production, at United Engineering Co., San Francisco. Details of the lighting to increase accuracy, improve efficiency, foster safety, are contained on page 64.

CHANGE OF ADDRESS

Circulation Manager,
Electrical West,
68 Post St.,
San Francisco 4, Calif.

Please change my address

From .....

To .....

Signed .....

People

A. C. McMicken general sales manager of Portland General Electric Co., who presents recent experience with electric house heating in his article on p. 47, speaks from a background of 34 years of pioneering in domestic load building. Mac, still as energetic and enthusiastic as ever, grew up in the utility business, having gone with the original Portland General Electric Co. in 1902. He sold motors, served as contract agent, and in 1911 became sales manager. His present title dates from 1936. No load-building problem has ever had Mac down, and his current article shows that he is thinking in terms of his company's responsibility in finding a market for some of the 300,000 kw. of spare capacity that will be available in the Northwest, postwar.

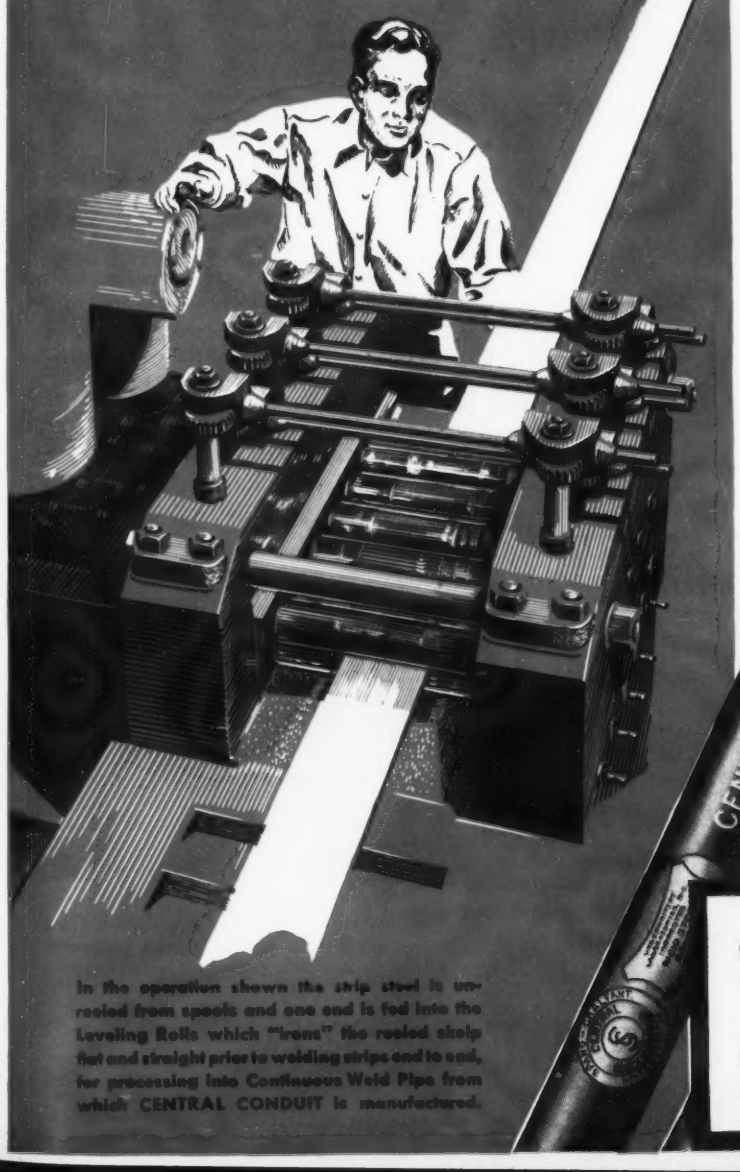
Preview

Before Tomorrow

It's an old ELECTRICAL WEST custom and a useful one, each year to sum up the past year's achievement and extend a line therefrom into the future. This custom, carried on with the excellent cooperation of all those in the industry who are asked to help with it, sets the goals of achievement for the year ahead. This year the custom will be observed in the February issue as usual. In the fields of engineering and construction, the data have been continuous and the graph from it can be predicted with reasonable certainty. In the sales and appliance field, the war has blown a large crater. Although the bottom of the hole is known, the ascent on the other slope still unknown. But able and experienced sales executives have been making thorough analyses of the situation. They have surveyed saturations and age and condition of existing equipment. On such studies they are computing the future market potentialities—reported next month.

CENTRAL RIGID STEEL CONDUIT

...is made from our own world famous SPANG PIPE... assuring the user of "Controlled Quality" in every phase of manufacture



In the operation shown the strip steel is unreeled from spools and one end is fed into the Leveling Rolls which "irons" the reeled skelp flat and straight prior to welding strips end to end, for processing into Continuous Weld Pipe from which CENTRAL CONDUIT is manufactured.

"There's Tested Strength in Every Length"

SPANG-CHALFANT

Division of The National Supply Company

General Sales Office: Grant Building, Pittsburgh 30, Pa.

District Offices and Sales Representatives in Principal Cities

SYLVANIA NEWS
CENTRAL STATION EDITION

JANUARY *Published in the Interests of Better Sight and Sound* 1945

Utilities Quickly Endorse Sylvania Maintenance Plan

The lighting experts of public utilities are giving enthusiastic approval to the Sylvania-sponsored plan for a complete fluorescent maintenance service, to be offered to commercial establishments by qualified electrical contractors. Lamp replacements and necessary repairs will be included in this service, as well as cleaning of lamps and reflectors.

Utilities see a maintained lighting load as the most immediate benefit accruing from the plan, since lamp outages will be eliminated by prompt replacement of old lamps.

RELIEF FROM NUISANCE CALLS

In addition, regular maintenance by contractors will free the utilities from nuisance service calls from their commercial customers—calls which now frequently occur when fixtures need repairing.

Contractors offering this maintenance service will have the benefit of Sylvania's technical assistance.

DID YOU KNOW...

That Sylvania Strobotrons, which emit pulsating light that appears to stop rapidly rotating machinery, offer valuable aid in motion studies? For example, Strobotrons are used to study the smoke patterns around moving fan blades—and from such examinations come data helpful in designing blades.

★ ★ ★

That in an installation of Sylvania Fluorescent Lighting in a broadcasting studio, the ballasts were located above a hung, soundproof ceiling? Not even the slightest hum can register in the microphones. Ballasts are mounted in ventilated metal boxes.

Sylvania Launches Nationwide Poll On Postwar Lighting Preferences

Interviews, Questionnaire Ads Will Gage Needs and Stimulate Interest

To study the lighting preferences of industry, business establishments, and domestic consumers; to stimulate interest in the subject of good lighting: these are the twin objectives of a nationwide survey being launched by Sylvania Electric Products Inc. Personal interviews will be conducted with executives in manufacturing plants, management groups in commercial establishments, and domestic power users, to form one phase of this intensive lighting survey.

Linked with this aspect of the program will be an extensive advertising campaign querying millions of readers on their lighting wants. Questionnaire-type advertisements will appear in leading national and general business publications.

The results of this survey, which will be reported from time to time in future issues of SYLVANIA NEWS, are expected to be of value not only to Sylvania in formulating its postwar plans, but also to public utilities in promoting better lighting.

"Pardon me, but do you plan to use fluorescent lighting in your business after the war?"

SURVEY EXPECTED TO BOOST POWER SALES

The lighting survey just initiated by Sylvania, while its primary objective is the study of lighting preference, is likely to have as an eventual by-product an increase in power sales. By making commerce, industry, and the public more conscious of the need for good lighting, the survey is expected to stimulate interest in improving present lighting levels.

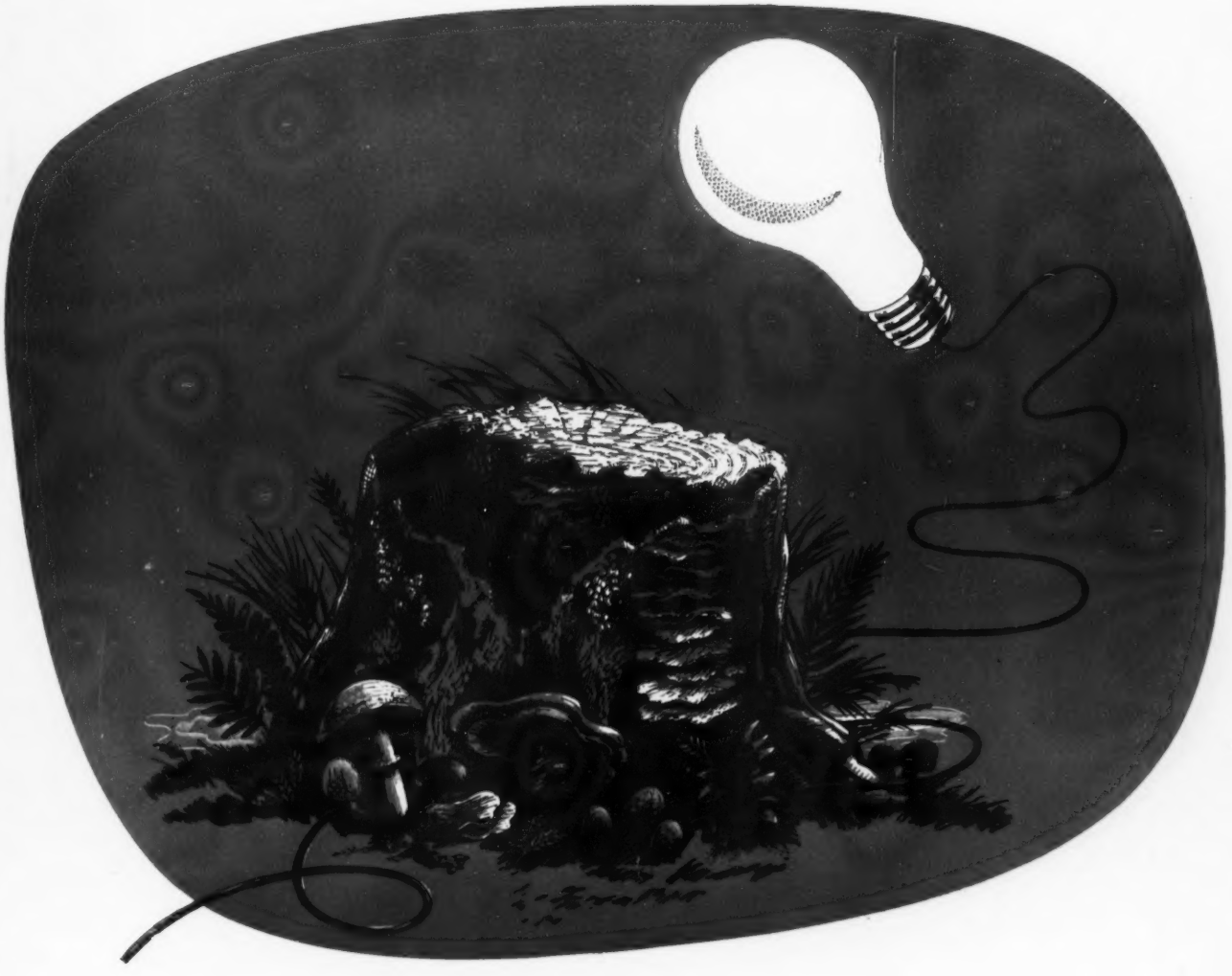
Hence the utility companies may benefit indirectly through increased power sales, as well as directly in the added data which the survey will place at their command.

Sylvania's Betty Light displays the first of the survey advertisements, appearing in January national magazines.

SYLVANIA ELECTRIC

SYLVANIA ELECTRIC PRODUCTS INC., Salem, Massachusetts

MAKERS OF FLUORESCENT LAMPS, FIXTURES, ACCESSORIES; INCANDESCENT LAMPS; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES



Laytex surprised even its creators!

It isn't often that one wire gets a world-wide action test in a world-wide laboratory. But Laytex — the original light-weight, small diameter wire — has had just that, and has come through with flying colors.

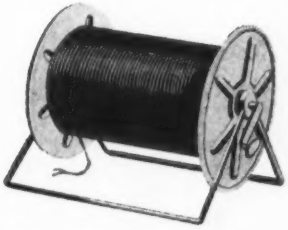
Laytex-insulated wire has followed our armed forces through arctic cold, tropic heat and moisture. It has defied insects and mold. It has been battle-tested under the most extreme conditions — and has stood up so well that it surprised even *us!*

Laytex has a record of delivering *more* electricity, *more* dependably, in *more* different jobs than any other wire we know.

Right now the entire output of Laytex Wires and Cables is going to the Armed Forces. But the day is steadily drawing nearer when manufacture will be resumed for Buildings, Police and Fire Alarms, Communications, Signalling, Power, Control, and other exacting services.

SERVING THROUGH SCIENCE TO PIONEER A NEW ELECTRICAL ERA

RUBBER INSULATION AT ITS BEST



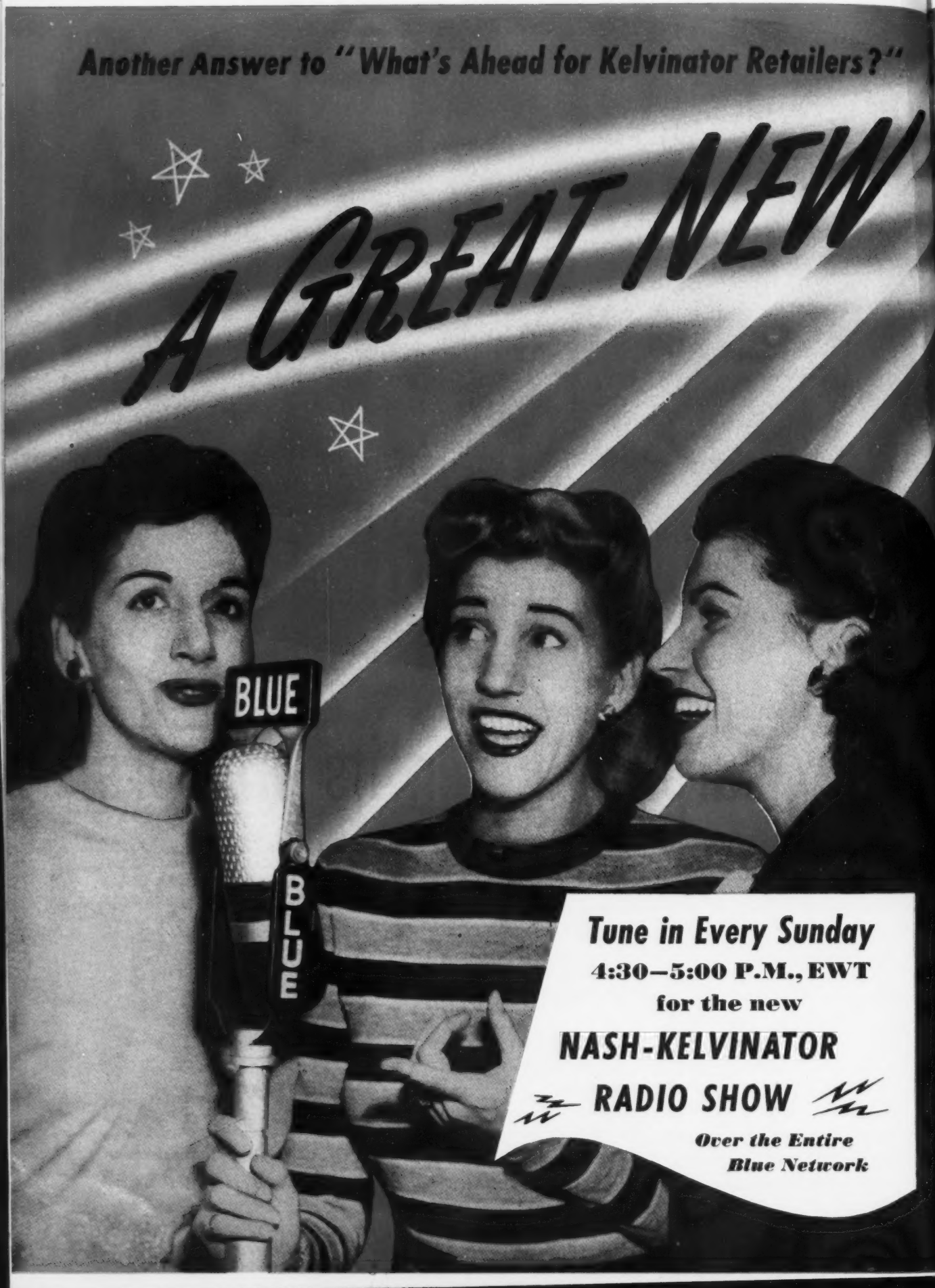
U.S. Laytex

Reg. U. S. Trade Mark

WIRES AND CABLES

UNITED STATES RUBBER COMPANY

1230 Sixth Avenue • Rockefeller Center • New York 20, N. Y. • *In Canada:* Dominion Rubber Co., Ltd.


Another Answer to "What's Ahead for Kelvinator Retailers?"
A GREAT NEW
BLUE
BLUE
Tune in Every Sunday
4:30—5:00 P.M., EWT
for the new
NASH-KELVINATOR
RADIO SHOW
Over the Entire
Blue Network

RADIO SHOW

STARRING "THE ANDREWS SISTERS" AND GUEST STARS OF STAGE ★ SCREEN AND RADIO

Now—to the great selling power of Kelvinator's national magazine campaign, Nash-Kelvinator adds the tremendous impact of radio—with a brilliant, new, half-hour musical comedy program broadcast every Sunday over the complete Blue Network of 189 stations, coast to coast.

Featuring the famous "Andrews Sisters," America's top singing trio . . . George (Gabby) Hayes, famous Western movie comedy star of Republic Pictures . . . Vic Schoen and his Decca Recording Orchestra . . . this newest radio show will have as guest stars each week the most famous names of the radio, stage, screen and musical worlds.

And its tremendous audience appeal will win increasingly greater consumer acceptance for the products Kelvinator Retailers will sell when the "green light" for production is given.

This is but one of the dramatic, retail-minded selling programs that will help build sales and profits for Kelvinator Retailers. It is another reason why, postwar, retailers with the Kelvinator Franchise will hold "the most valuable franchise in the Appliance Industry."

LOOK AHEAD WITH KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

Kenosha • Milwaukee • DETROIT • Grand Rapids • Lansing

FOR APPLIANCE DISPLAY

Coming soon—a new book of modern store and appliance department layouts to help Kelvinator Retailers plan for greater sales through better display.

A modern maintenance tool for utilities

G-E 2-WAY FM RADIO

Government regulations now permit new installations of 2-way FM radio for important requirements of utility companies. Let your G-E representative help prepare your applications.

"Watch-dogging" distribution systems to assure power continuity under year-round conditions of natural and accidental hazards is a major responsibility. Tomorrow, expanded power systems bringing with them the ever-growing problems of exposure, will increase that responsibility.

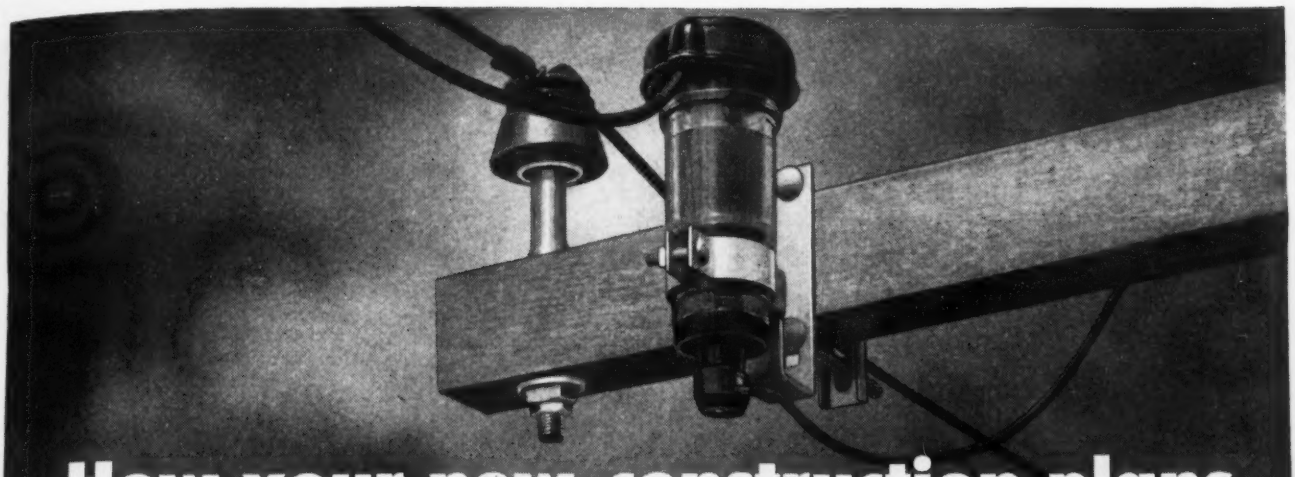
For improving "round-the-clock" service even beyond present high standards and meeting emergencies throughout your circuit mileage, use G-E 2-way FM radio. It will provide the means for immediate dispatch of maintenance crews from one job to another. It will save valuable repair time. It will lower maintenance costs. Call your G-E sales engineer when you discuss your communication problems. He will have a competent specialist assist in planning the most effective system for your particular installation.

In serving your 2-way radio communication requirements, G. E. offers the same specialized attention and reliable service that is extended to you in your power distribution and maintenance requirements. *Electronics Dept., General Electric, Schenectady 5, N. Y.*

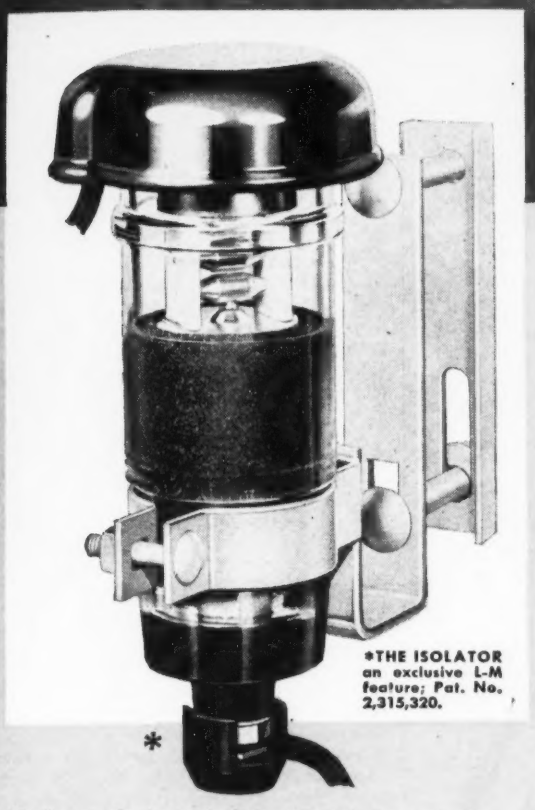
Write for these booklets: "G-E FM Communication System Guide" is a bulletin that gives practical every-day-language facts about the selection of 2-way FM radio and will assist you in estimating total installation costs. "G-E FM Communication Equipment Catalog" describes and illustrates the required units and accessories.

Tune in General Electric's "The World Today" and hear the news from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS network. On Sunday evening listen to the G-E "All Girl Orchestra" at 10 E.W.T. over NBC.

GENERAL ELECTRIC



How your new-construction plans can benefit by this advanced research



*THE ISOLATOR an exclusive L-M feature; Pat. No. 2,315,320.

It's the way they're made that results in better protection... less replacement... lower arrester costs.

1. Ladder gap of solid 7/16" brass bar accurately machined, and spaced in isolantite supports.
2. Characteristic element *molded* into glass housing (porcelain also used temporarily as a wartime measure).
3. Completely moisture-proofed: 2 main seals; 4 auxiliary seals; assure permanent protection.

STANDARDS: All L-M Lightning Arresters meet new NEMA standards; maintain uniform characteristics throughout life of arrester.

SIZES: Made in 6 sizes from 1 to 15 Kva. ratings.

THE economical construction and operation of new lines will be achieved more easily when your planning takes advantage of Line Material's research, and L-M developments in materials and products.

Years ago, Line Material Company set up a research program to develop methods of satisfying the industry's need for products exceeding the standards then considered attainable.

One example of the resulting constant improvement is Line Material Lightning Arresters. Again and again, L-M has pioneered in improvements which later have become the accepted standard. Several types have been developed, to satisfy various operating requirements.

Today, L-M Lightning Arresters give greater protection, and greater value, than any this company has ever offered. It will pay you to standardize on them for your present and your future construction. The L-M field engineer's knowledge and experience are at your service, to help you select the types that will best fit your requirements. Call or write the nearest L-M branch office. Line Material Company, Milwaukee 1, Wisconsin.

LM

LINE MATERIAL
LIGHTNING ARRESTERS

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers · Fuse Cutouts and Fuse Links · Lightning Arresters · Oil Switches · Pole Line Hardware · Line Construction Specialties · Underground Equipment · Fibre Conduit · Street Lighting Equipment

THANKS, **Mr. Providence,**

Mr. Syracuse,

Mr. Scranton . . .

YOU appliance dealers of three cities have just given us some fine ideas on postwar merchandising. Our survey will continue: because Proctor believes in market research . . . to find out what kind of appliances dealers want to stock and sell . . . to find out what kind housewives want to buy!

Good ideas make good appliances

You start with good ideas. You add fine product engineering. Then . . . smart styling and an attractive price tag. There you have it—the line of Proctor appliances that will make news after victory. Meanwhile, "back the attack" with war bonds.

PROCTOR

NEWSMAKER IN APPLIANCE MERCHANDISING

PROCTOR ELECTRIC COMPANY—*DIVISION*, PROCTOR & SCHWARTZ, INC., PHILADELPHIA 40, PA.

BOOKS

you may want

ALTERNATING CURRENT BRIDGE NETWORKS (fifth edition), by B. Hague, S. Sc., Sir Isaac Pittman & Sons, $8.50.

The Wheatstone bridge, first developed in 1836, is a familiar tool to many electrical people for measuring resistance; but probably few even among electrical engineers appreciate the bewildering variety of present-day uses for localization of faults, for control circuits in electric power and communication systems, and for measurements of frequency, power factor, capacitance, inductance and conductance, in present industrial application.

Dr. Hague's *Theoretical and Practical handbook for the Use of Advanced Students* is the outstanding compendium of the extensive periodical literature pertaining to bridge measurements in the audio-frequency range. He makes no pretense to give details of design and techniques for the higher frequencies employed in carrier and radio practice.

Originally published in 1923, this handbook marshals the contributions of all nations in its copious references. The chapter headings, *Fundamental Principles—Alternating Current Theory—Apparatus—Classification of Bridge Networks—Choice of Method* and *Precautions*, merely outline the exhaustive, careful treatment. It is highly illuminating as text and reference, appears in convenient thin paper format, and has excellent indexes.—D.I.C.

OCCUPATIONAL ACCIDENT PREVENTION by Harry H. Hudson and James M. Brown. 234 pages, 8¾ x 6, John Wiley & Sons, $2.75.

This book is an important addition to safety literature in that it serves a dual purpose: (1) as a guide for safety directors and (2) as a fine text for supervisory employees and foremen who are interested in industrial safety engineering. It does not treat so much with safety itself, as it does with the fundamentals in plant layout and operation which prevent accidents.

Content is divided into three parts. The first deals with improvement in working procedures including such subjects as plant housekeeping, material handling, maintenance, prevention of falls, hand tools, personal protective equipment and employee training. In the second section improvement in plant as it relates to accident prevention is discussed. Noteworthy are chapters on illumination and unsafe electrical conditions. The final section relates to safety activities including compensation laws, safety organization, plant inspections, accident reports, standards and codes, first aid facilities, etc.

There are two valuable appendices—one outlining the standard method of compiling industrial accident rates and the second listing notable safety sound slide films.—G. C. T.

LIGHT, VISION AND SEEING, by Matthew Luckiesh, 323 pages, 5½ x 8½, D. Van Nostrand Co., N. Y., $4.50.

In this book, the author presents in condensed form, knowledge gained from 30 years of continuous research. He has coordinated and simplified the complex subjects of light, brightness, vision and human seeing; has reduced data to simple diagrams. One chapter answers 100 questions frequently asked about eyesight and vision.

A modern, low-cost method of centralizing motor control and combining it with an AIR-COOLED Transformer has long been requested by Plant Engineers.

Now—it's here! . . . an air-cooled Power Center as acceptable in appearance as it is in performance. No need to hide *this* unit in a vault . . . either for looks or for safety. Install it anywhere indoors without fireproof vaults.

A Westinghouse Power Center is a completely co-ordinated unit substation, factory-assembled and tested, and delivered to your plant ready to be connected for service. It consists of:

A HIGH-VOLTAGE SECTION (15,000 volts or less)
A TRANSFORMER SECTION (2,000 kv-a or less)
A LOW-VOLTAGE SECTION (600 volts or less)

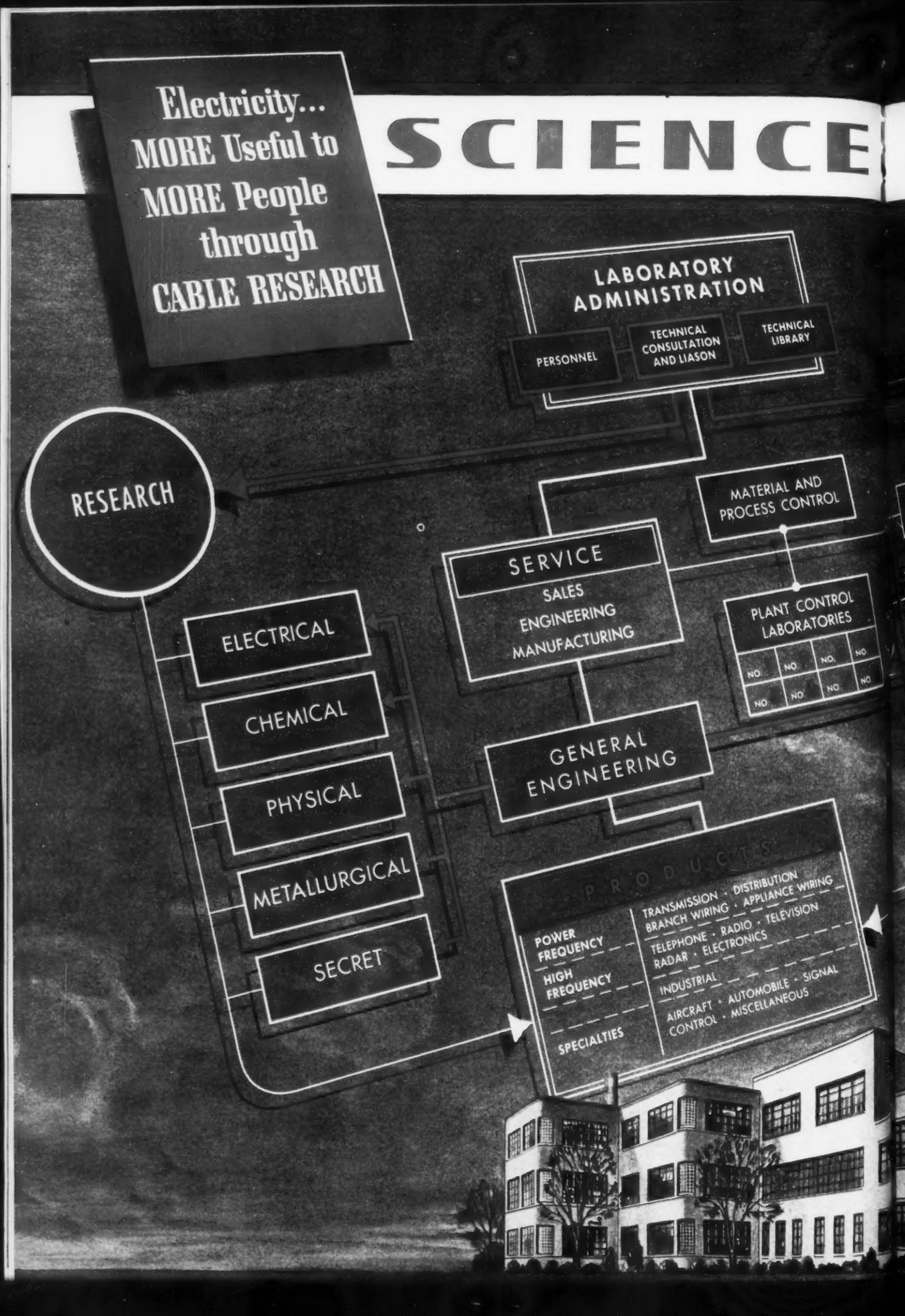
By installing this Packaged Power *at* load centers, you'll save as much as 75% of the copper required for secondary runs and improve voltage regulation. Ask your Westinghouse representative for details. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-70431

IT'S HERE

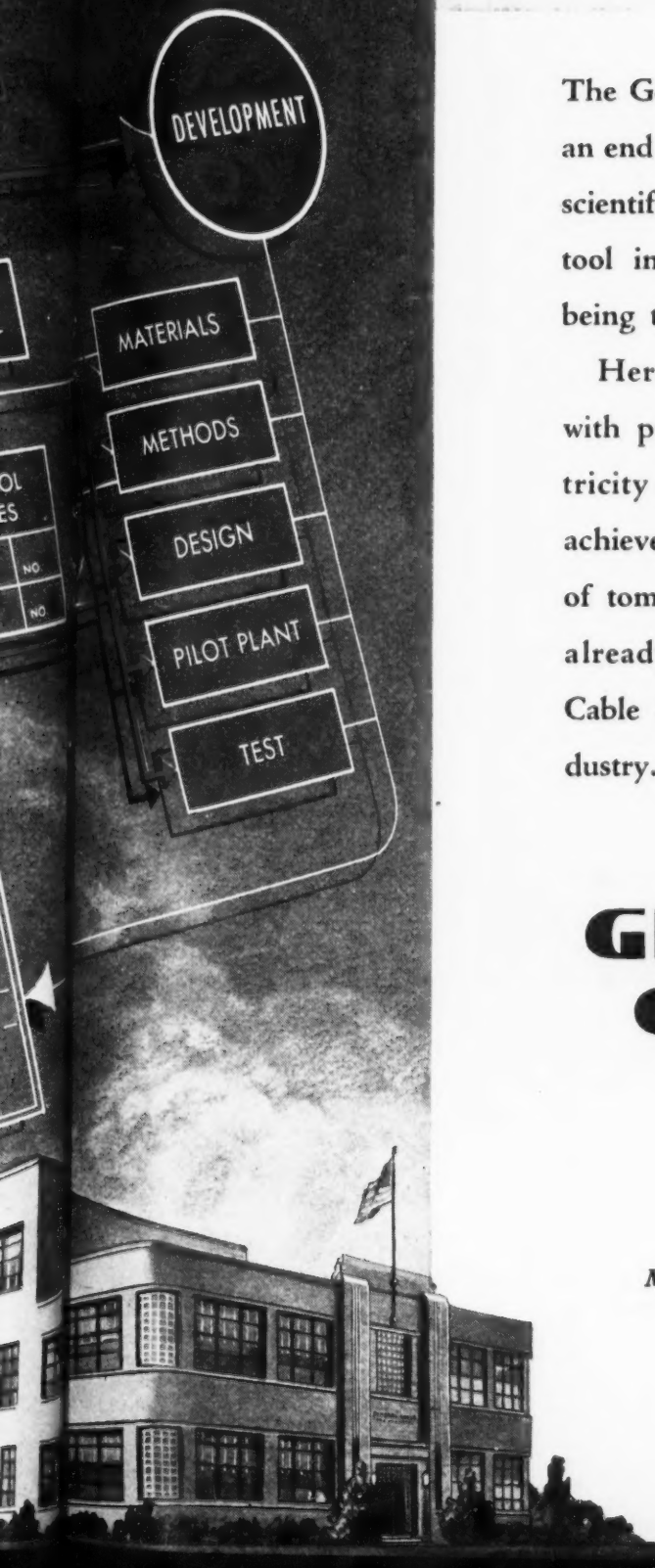
A SMART LOOKING, NEW *Air-Cooled* POWER CENTER

Westinghouse
PLANTS IN 25 CITIES OFFICES EVERYWHERE

PACKAGED POWER


Electricity...
MORE Useful to
MORE People
through
CABLE RESEARCH
SCIENCE
LABORATORY ADMINISTRATION
PERSONNEL
TECHNICAL CONSULTATION AND LIASON
TECHNICAL LIBRARY
RESEARCH
MATERIAL AND PROCESS CONTROL
SERVICE
SALES
ENGINEERING
MANUFACTURING
PLANT CONTROL LABORATORIES
NO. NO. NO. NO.
NO. NO. NO. NO.
ELECTRICAL
CHEMICAL
PHYSICAL
METALLURGICAL
SECRET
GENERAL ENGINEERING
PRODUCTS
POWER FREQUENCY
TRANSMISSION · DISTRIBUTION
BRANCH WIRING · APPLIANCE WIRING
HIGH FREQUENCY
TELEPHONE · RADIO · TELEVISION
RADAR · ELECTRONICS
INDUSTRIAL
SPECIALTIES
AIRCRAFT · AUTOMOBILE · SIGNAL
CONTROL · MISCELLANEOUS

E..ORGANIZED



The General Cable Research Laboratory is by no means an end in itself. The great, new building, its facilities and scientific equipment are but an impressive and efficient tool in the hands of the men who are bringing into being this Company's far-visioned industrial program.

Here, pure and applied research go hand in hand with product development, to extend the use of electricity more usefully to more and more people. The achievements now in the making and the achievements of tomorrow will complement the substantial advances already "on the record", by virtue of which General Cable has won and maintained its position in the industry. Research is the spearhead of progress.

GENERAL CABLE CORPORATION

Manufacturers of Bare and Insulated Wires and Cables for Every Electrical Purpose

• RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES • PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • SYNTHOL WIRES • WELDING CABLES • SHIPBOARD CABLES • IMPERIAL NEOPRENE JACKETED PORTABLE CABLES • ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • BUILDING WIRE •

For Wet Locations!

CRESCENT

SYNTHOL TYPE SNW

BUILDING WIRE

Insulated with a special thermoplastic that is extremely resistant to ● moisture ● acids ● alkalies and oil ● inherently flame retarding ● high dielectric and mechanical strength ● bright, permanent colors ● small diameter ● easy pulling ● free stripping

SYNTHOL *Type* SNW

is approved by Underwriters Laboratories in sizes from No. 14 through No. 4/0 A W G under Section 3035 of the 1940 N. E. Code for use in raceway systems, such as:

(a) Underground;
(b) In concrete slabs or other masonry in direct contact with the earth;
(c) In wet locations;
(d) Where the condensation and accumulation of moisture within the raceway is likely to occur.

Write for Descriptive Folder on SYNTHOL Types SNW and SN

CRESCENT

WIRE and CABLE

NEMA

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

PRODUCTS

that are news

Dryer (100)

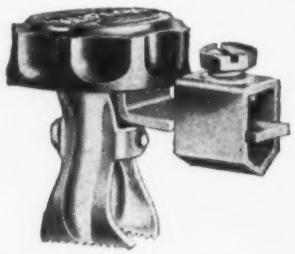
An electric dryer will be manufactured by Westinghouse when restrictions are lifted. A companion to the company's Laundromat, the dryer will resemble it externally. The dryer will contain a large metal tub, which rotates at slow speed while a fan circulates a current of air, warmed by electric heaters. The entire operation is automatic; when the moisture has been evaporated air temperature rises abruptly, a temperature detector then opens the heater circuit.

The tub may be stopped automatically when the clothes are dry or can be left turning until the operator is ready to remove them, the latter method being recommended for flat work where a soft finish is desired.

Test Clamp (101)

Trico Fuse is making a new test clamp line, which it claims employs a tremendous jack-screw gripping action. The company recommends the line for making heavy-duty temporary connections, motor and meter testing, jumpers, cable and bus bar taps, battery charging, welding and other shop and laboratory purposes.

Pressure is exerted by a twist of a finger-tip safety knob, supplying large carrying



capacity of 20 to 350 amp. on constant and intermittent duty, the announcement states. Solderless lugs are arranged to swivel around the clamp, permitting wires or cables to hang in natural position after installation.

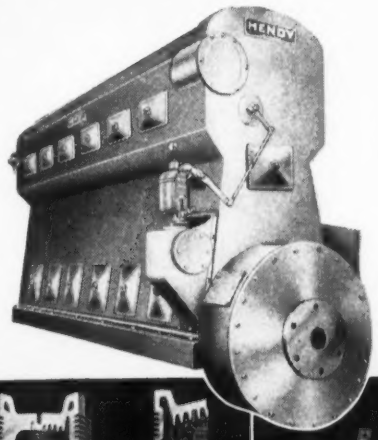
These clamps are available in six sizes to fit across ferrule and knife blade fuse clips, switch blades, round or flat bus bars, cables, etc.

Live Lathe Center (102)

A "live" lathe center for handling heavy loads has been announced by Ideal Commutator Dresser Co. According to the manufacturer, this center has a guaranteed tolerance of .0000 to .0005. To handle radial loads up to 5,750 lb. and thrust loads up to 8,500 lb., a special bearing arrangement is used. Made with the No. 6 Morse taper only; shipping weight approximately 20 lb.

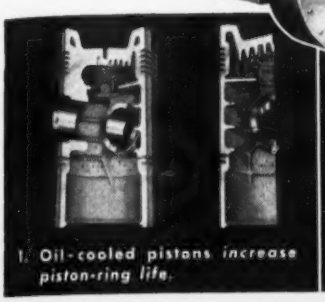
Cover Plate (103)

Tinnerman Products, Inc., has announced manufacture of a speed nut cover plate, which it states may be used to seal up holes left after alterations, as removable covers for inspection doors, access holes and vent holes. Three sizes are available to fit a range of panel thicknesses and to cover holes 29/32, 1⅛ and 1⅜ diameter; other sizes on special order.

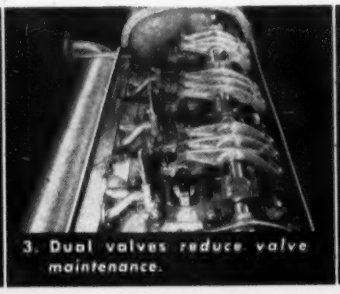


22 PROVEN DIESEL FEATURES

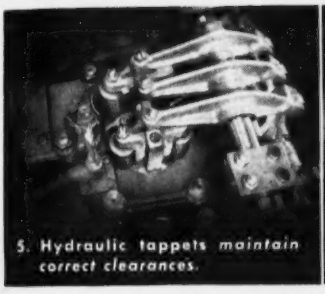
ONLY HENDY COMBINES THEM ALL


1. Oil-cooled pistons *increase piston-ring life.*

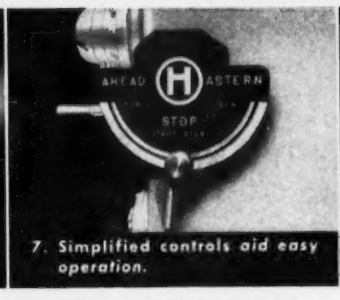
2. Unit fuel injectors *eliminate high-pressure lines.*


3. Dual valves *reduce valve maintenance.*

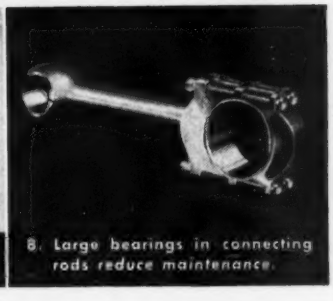
4. Overhead camshaft *eliminates push-rod linkages.*


5. Hydraulic tappets *maintain correct clearances.*

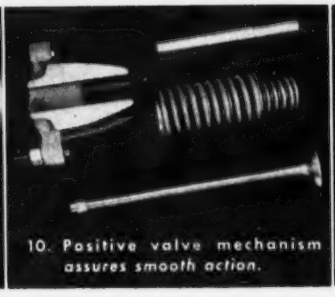
6. Large-diameter crankshaft *for reliability.*



7. Simplified controls *aid easy operation.*


8. Large bearings in connecting rods *reduce maintenance.*

9. Welded steel bedplate *assures great rigidity.*


10. Positive valve mechanism *assures smooth action.*

11. Front-clutch power take off for auxiliaries.

OTHER FEATURES *not pictured here*

12. Removable main bearings
13. Double rear main bearings
14. Jet-action head cooling
15. Cage-type relief valves
16. Uniform-tension camshaft drive
17. Air-operated starting valve
18. Large-capacity cooling pumps
19. Mechanical or hydraulic governor
20. Water-cooled exhaust manifold
21. Fresh-water cooling
22. Full pressure lubrication

THE important fact about Hendy Diesels is that they combine, for the first time in a single engine, 22 of the most modern design features. Every one of these features was selected by Hendy engineers as a proven and practical development in Diesel design.

Only Hendy Diesels have all twenty-two! Examine the full list above—you are undoubtedly familiar with some—you'll want to know more about the others. Send for data available now on 6 or 8 cylinder Hendy Diesels from 350 to 675 hp, designed for a wide variety of industrial uses or with generators as complete electric plants.

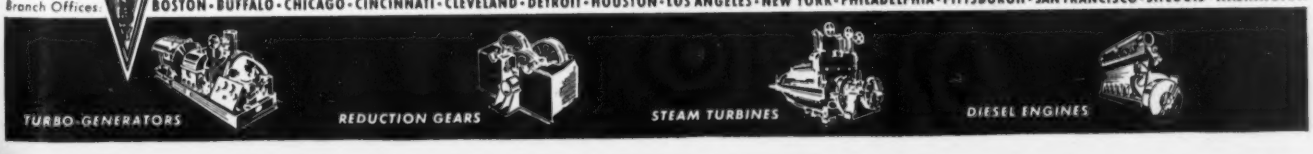
JOSHUA **HENDY** IRON WORKS

ESTABLISHED 1856

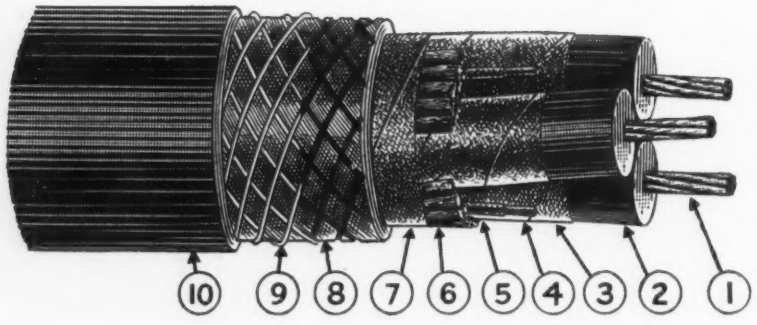
SUNNYVALE, CALIFORNIA

65-D-10

Branch Offices: BOSTON · BUFFALO · CHICAGO · CINCINNATI · CLEVELAND · DETROIT · HOUSTON · LOS ANGELES · NEW YORK · PHILADELPHIA · PITTSBURGH · SAN FRANCISCO · ST. LOUIS · WASHINGTON



Performance Records Prove Simplex-Tirex Quality



1 Power Cond.
2 Insulation
3 Tape
4 Ground Cond.
5 Braid
6 Filling
7 Tape or Binders
8 Inner Jacket
9 Seine Twine
10 Outer Jacket

Simplex - Tirex Type G

If you could watch the manufacture of TIREX Cords and Cables, follow them step by step, process by process through our plant, you would clearly understand why they are so good. From the small copper wires that make up the flexible conductor right through to the smooth, tough, abrasion resistant rubber sheath, they are designed for hard service. Each is as good as we can make it and performance records furnish abundant evidence that there are none better.

Type W - without ground wires.
Type G - with ground wires.
Type SH-A - without ground wires, shielding over each conductor.
Type SH-B - without ground wires, shielding over cabled conductors.
Type SH-C - with ground wires, shielding over cabled conductors.
Type SH-D - with ground wires, shielding over each conductor.

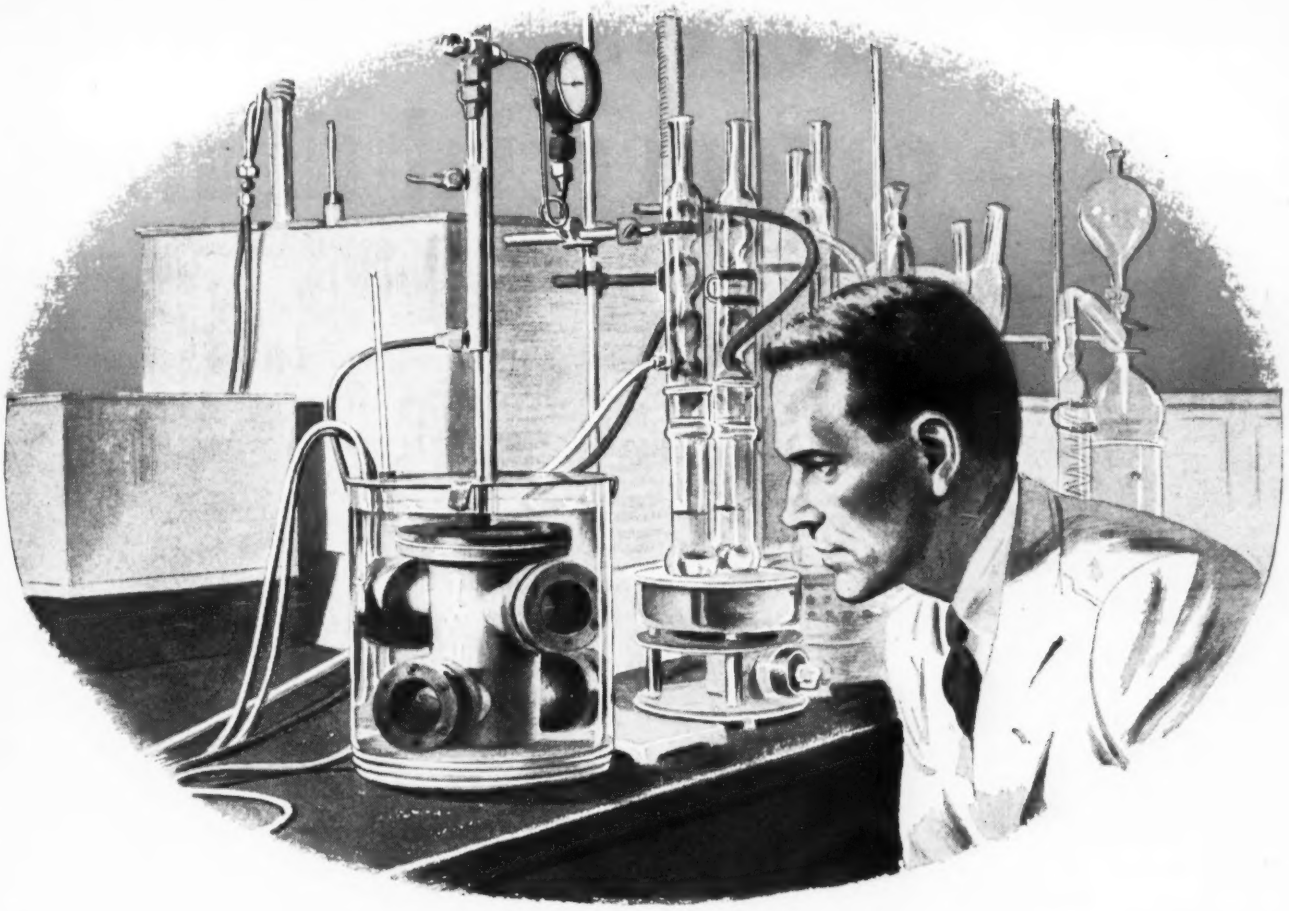
A small TIREX cord for a portable tool is made with the same care and precision as a TIREX cable for a mammoth shovel or dredge. Careful selection of materials, skilled workmanship, frequent inspections and tests, these all lead up to a finished product from which it is reasonable to expect trouble-free service.

If you need an electric cord or cable where flexibility, electrical stability and abrasion resistance are important you can trust TIREX. The satisfactory service that TIREX rubber sheathed cords and cables have rendered to mines, quarries, shipyards, railroads and industry of every sort during the past twenty-five years is ample evidence that they will not let you down now.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex

WIRES and CABLES



How will this "Soxhlet" help give Frigidaire Dealers still better products to sell?

FEW PEOPLE have ever seen this "Pressure Soxhlet," a unique instrument developed by Frigidaire Research Engineers. It's used to "turn a refrigerator mechanism inside out" . . . to examine every part and material of a mechanism . . . to see what happens through a "lifetime" of operation.

The "Soxhlet" is only one demonstration of that spirit of creative research which has spurred Frigidaire Engineers on to new leadership — year after year.

Proof of this Engineering leadership is in all the major advancements Frigidaire has contributed to make modern refrigerators so convenient, dependable, and economical!

To name only a few —

Frigidaire and General Motors pooled their scientific knowledge to develop "Freon," the world's first and only *safe* refrigerant.

Frigidaire led the way to better refrigeration of fruits and vegetables with the Hydrator . . . provided temperature regulation, sped ice freezing, simplified dessert making, with the Cold Control . . . offered the first Frozen Storage Compartment.

Frigidaire was first to provide trigger-quick ice cube release, with its celebrated Quickube Tray and Automatic Tray Release.

Frigidaire set new standards of performance and economy with its famed Meter-Miser, the simplest refrigerating mechanism ever built!

Frigidaire opened an entirely new era of more efficient, more convenient food preservation with the development of the Cold-Wall refrigerator.

And these are only a few examples of the Engineering leadership that has helped Frigidaire Dealers maintain consistent *selling leadership!*

It also provides the Frigidaire Dealer with the strongest assurance of product and selling leadership in the future. He *knows* that he will be able to offer his customers the kind of advanced refrigerators, electric ranges and other appliances that they are expecting. *He knows* that he will be able to take fullest advantage of the great selling opportunities that lie ahead. *He knows* Frigidaire Engineering will always provide better *and better* products for Frigidaire Dealers to sell.

3 Reasons for Frigidaire Engineering Leadership

1—Frigidaire maintains a *complete* Research-Engineering Organization, an organization skilled in not just one or two sciences, but in *all* the sciences concerned in the products it manufactures—chemistry, electricity, mechanics, metallurgy, ceramics, and the rest.

2—Frigidaire Research is never satisfied. Long before a product reaches Frigidaire Dealers and the public, Frigidaire Engineers are searching for ways to make it better.

3—Frigidaire Engineering is backed by the tremendous resources of General Motors.

Look to Frigidaire for Leadership through Engineering!

For Excellence in War Production — ARMY NAVY E

FRIGIDAIRE
Division of
GENERAL MOTORS
DAYTON 1, OHIO • LEASIDE 12, ONTARIO
Peacetime Builders of
ELECTRIC REFRIGERATORS • RANGES • WATER HEATERS
HOME FREEZERS • ICE CREAM CABINETS
COMMERCIAL REFRIGERATION • AIR CONDITIONERS
BEVERAGE, MILK, AND WATER COOLERS

Here's something commercial lighting

READY FOR IMMEDIATE ACTION NOW! Everybody is agreed that the postwar store lighting market will be tremendous. And 'most everybody has plans for developing it . . . plans that call for manpower and materials that won't be available until war's end.

The General Electric Lamp Department's "nest egg" plan is something you can do *now* to sell better postwar store lighting. It's a practical plan you can start immediately. You can do it with your present manpower. And it will pay handsome dividends at the earliest possible moment. Read how it works!

1 SELECT YOUR NEST EGGS. Find a good prospect for modernized lighting in each neighborhood in your territory . . . explain to the owner how better lighting will attract more customers and build sales . . . and show him how his can be one of the *first* stores in that neighborhood to be relighted.

2 ORDER THE MATERIALS NOW. Bring a contractor and supplier in on the job . . . make a layout for the store's general lighting, and showcase, display and decorative lighting, both incandescent and fluorescent. Place orders for the fixtures, lamps and all other materials NOW, for delivery as soon as available.

Hear the General Electric radio programs: "The G-E All-Girl Orchestra", Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday 6:45 p. m. EWT, CBS.

GENERAL ELECTRIC

you can do NOW about

Facts About General Electric's "Nest Egg" Plan For Selling Better Store Lighting

3 **GET THE NEST EGGS INSTALLED FIRST.** With all this preliminary work done, you can see to it that these stores are among the first in their neighborhoods to be relighted... shining examples of good lighting... "nest eggs" that will make other stores in the same neighborhoods want good lighting jobs.

4 **NEST EGGS ARE EASY TO SELL.** Today, your neighborhood "nest eggs" are easier to sell than ever before. Store owners want better lighting... and G-E Lamp advertising is showing it to them... with full-page ads in more than 20 publications covering 15 different types of commercial establishments.

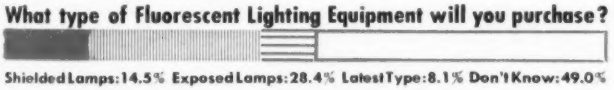
5 Recent General Electric Lamp Department surveys show the great majority of storeowners plan to relight. Look at the answers to these questions!

Will you purchase Fluorescent when it becomes available?

Yes: 65.9% Undecided: 16.1% No: 18.0%

Two-thirds of the storeowners interviewed are planning to relight with fluorescent. They'll buy better all-round lighting if "nest eggs" lead the way.

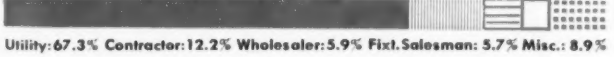
What type of Fluorescent Lighting Equipment will you purchase?



Shielded Lamps: 14.5% Exposed Lamps: 28.4% Latest Type: 8.1% Don't Know: 49.0%

Half the 1276 storeowners surveyed didn't know what kind of equipment they will buy. "Nest eggs" will help them decide.

To whom will you go for advice?



Utility: 67.3% Contractor: 12.2% Wholesaler: 5.9% Fixt. Salesman: 5.7% Misc.: 8.9%

The big majority *want* your advice. The "nest egg" plan is a way to help them.

Some utilities already have started work on the "nest egg" plan. Shouldn't you consider it for the shopping areas in your territory?

"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"
The Constant Aim of G-E LAMP RESEARCH

BUY MORE WAR BONDS—AND HOLD 'EM

G-E MAZDA LAMPS

every LINEMAN a KLEINMAN!

WHEN Mathias Klein first dedicated his little forge shop to the manufacture of fine tools, the new force of electricity was just beginning to affect the lives of millions of American citizens.

Since that time, one generation of linemen has passed the word to the next: that for the tough job of keeping communications open—of keeping power flowing—only the best in equipment is good enough.

Linemen's pliers and wrenches, belts and straps, climbers and grips have kept pace with the amazing technological advancement in the electrical industry. But this equipment today has this in common with the equipment that the pioneer lineman used—it still carries the name Klein.

In 1945, as when the first wires were strung, America's linemen are still Kleinmen.

ASK YOUR SUPPLIER

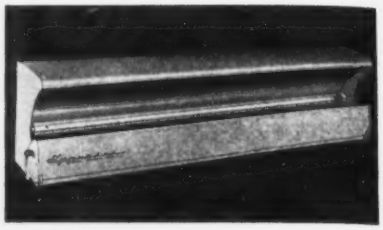
Foreign Distributor:
International Standard Electric Corp.
New York

Since 1857

This book on the care and safe use of tools will be sent without charge upon request.

Mathias KLEIN & Sons
Established 1857
Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

Sterilizer (104)



American Sterilizer Co. has restyled its Hygeaire unit for air disinfection. The new model uses a G-E germicidal tube to project intensified ultraviolet rays across working areas above eye level. The unit may be recessed into the wall or suspended from wall or ceiling. Distribution is through Graybar and G-E Supply.

Breaker Recloser (105)

Westinghouse has a new type automatic oil circuit breaker recloser designed for use on suburban rural distribution systems.

This recloser operates a maximum of three times on temporary faults with two-second intervals between operations. If the fault clears on the first, second or third tripping operation, the recloser resets automatically to the original position. If the fault is permanent, it will lock out and open the circuit on the fourth tripping operation.

Breaker ratings are 5, 10, 15, 25 and 50 amp. continuous rated, with interrupting capacities of 150, 200, 375, 600 and 1,200 amp. Breakers are suitable for application on 2,400- to 13,800-volt circuits and are connected in series with the line.

The recloser includes a built-in lightning arrester in the top casting.

Welder (106)

A direct-current 200-amp. welder weighing 333 lb. has been announced by Westinghouse. According to the manufacturer, weight reduction has been achieved without change in basic form of construction. Steel is used for structural parts. An improved ventilating system is said to account for much of the weight reduction.

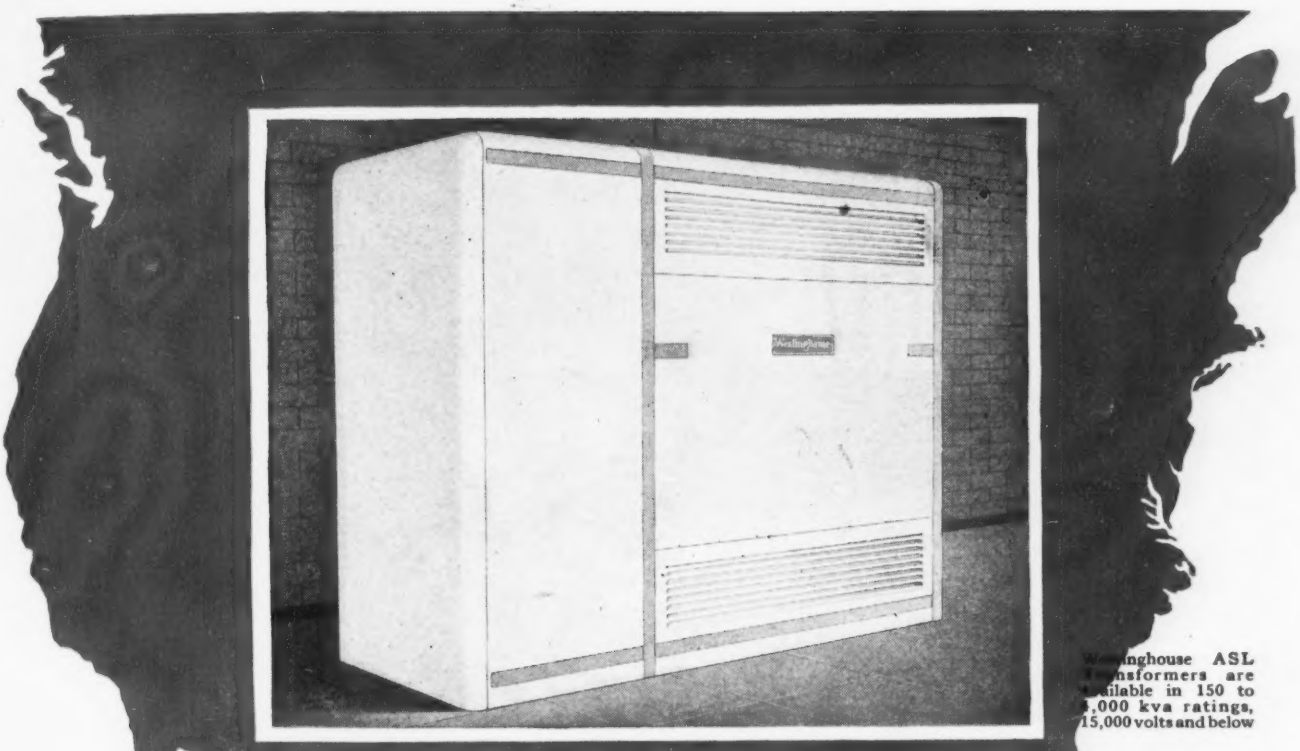
The welder is mounted on skids. An oval handrail surrounds the set so that it can be carried by four men to different parts of the ship. These welders at present are not available for industrial use, since full production is going to the Armed Services.

Relay (107)

Struthers-Dunn has a new vacuum switch keying relay, which was designed for aircraft use but is said to have applications in other fields. The relay has seven poles, including one double-throw pole, which handles high-voltage radio-frequency currents by means of a vacuum switch. All high-voltage parts are rounded to reduce corona.

Pressure Gauges (108)

Brown Instrument Co. has introduced two new types of highly sensitive pressure gauges. One of the new types has a single spring for pressure ranges; the other has a second spring, in tandem with the first, for vacuum and compound ranges. These gauges measure ranges between zero and 5 in. and zero and 50 in. of water.



Westinghouse ASL Transformers are available in 150 to 3,000 kva ratings, 15,000 volts and below

1,000,000 kva says OK!

Dust . . . dirt . . . fumes . . . heat . . . dampness . . . condensation . . . none of these enemies of electrical equipment found in metal-working shops, coal mines or paper mills, in both temperate and tropical zones, have been able to affect the operation of Westinghouse Type ASL Air-Cooled Transformers.

Since their introduction in 1936, Type ASL Transformers have received extensive field testing—particularly by emergency war loads which have compressed decades of normal operation within a few years. Over 2,000 installations, totaling more than 1,000,000 kva, are proof today that the ASL Air-Cooled Transformer is the one right answer for indoor industrial plant distribution systems.

For complete information call your Westinghouse Office, or write Westinghouse Electric & Manufacturing Company, Box 868, Pittsburgh 30, Pa. J-70434

THE ASL TRANSFORMER COMBINES:

1. **GREATER SAFETY**—No cooling liquids—no fire or explosion hazards. No vault is required.

2. **GREATER RELIABILITY**—Winding temperature is not a critical factor in loading . . . heavy overloads carried safely.

3. **LOWER INSTALLATION COST**—Transformers can be placed indoors near load centers—no long secondary runs of heavy copper—no catch basins or drains are required. Lighter weight and easier to handle in the larger ratings.

4. **LOWER MAINTENANCE COST**—No periodic liquid reconditioning—no gasketed joints to maintain, no valves to leak. Maintenance is negligible, even in dust-laden atmospheres.

5. **GREATER SPACE ECONOMY**—In large ratings ⅓ or more of the space that is required by liquid-filled transformers may be saved.

6. **LOWER COMBINED COST**—In major substation design, both air-cooled transformer and metal-clad switchgear with air breakers can be installed INDOORS as a completely metal-enclosed, multiple unit substation . . . saving cable cost, space and installation work.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Packaged Power

By now you've probably heard a great deal about Bethlehem's simple new serving tool. How it makes possible a tremendously strong serve by means of the dead-end coil method; how it's so easy to use that any lineman can learn to handle it in a few minutes; how the serve can be made in about the time required to attach conventional clamps.

But there are other advantages, too, that are by no means incidental. Economy, for one thing. Bethlehem dead-end wire, used with the tool, costs only a few cents per 10-foot coil—considerably less than even a single inexpensive clamp. The savings mount accordingly where two or three clamps would be required.

And another thing: when linemen use the serving tool, there is no need to carry many items of different-sized clamps on field trucks or in store inventory. All you require is a supply of dead-end wire in 10-foot coils, each coil being enough for a complete serve of 50 turns on strand sizes up to and including 7/16 in.

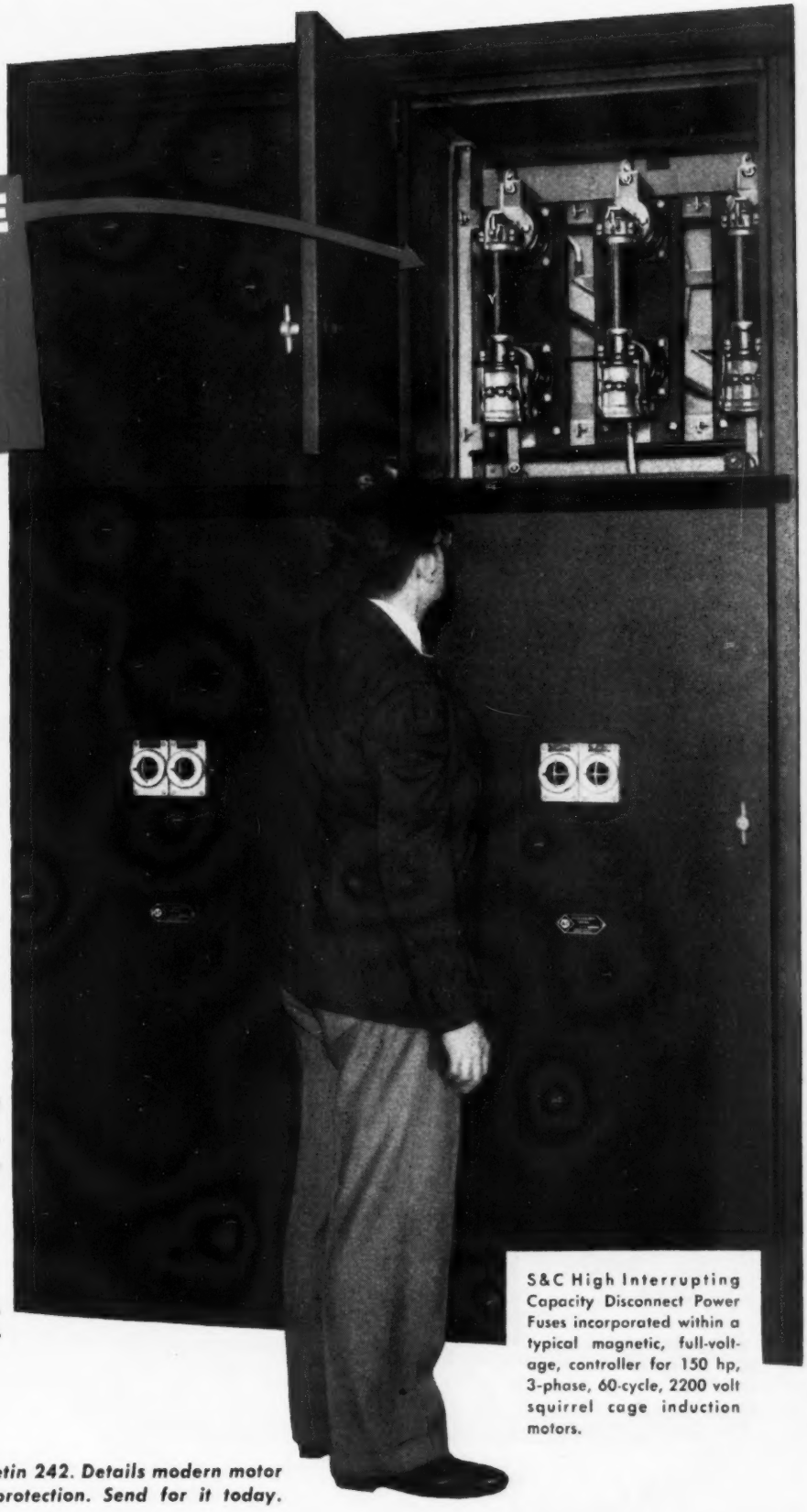
The serving-tool technique is recommended primarily for use with bethanized strand and bethanized dead-end wire. Bethanizing simply means that a uniform, ductile, protective zinc coating is applied to every wire by an exclusive electrolytic process. The zinc coating is more than 99.9 per cent pure, and the years have amply demonstrated its effectiveness against corrosion.

Remember this trio—the Bethlehem serving tool, bethanized strand, and bethanized dead-end wire. Used in combination, they mean simplicity and economy—plus serves that hold beyond the useful strength of the strand. Ask a Bethlehem man for full details.

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

On Modern High-Voltage Motor Controls, too—

"EXPERIENCE CHOOSES S & C FUSES"



For dependable short-circuit protection of 2300 and 4600 volt motors, leading controller manufacturers choose S&C High Interrupting Capacity Power Fuses.

Long used on utility and industrial substations, these fuses are now demonstrating their advantages on high voltage motor applications, too.

They provide safe, reliable, short-circuit protection up to 150,000 kva at 2300 volts and to 300,000 kva at 4600 volts, at substantial savings in all-around costs, space, and maintenance.

Motor controller assemblies are equipped with thermal overload relays that prevent possibility of motors operating single-phase.

It will pay you to get the facts.

SCHWEITZER & CONRAD, INC.
4425 Ravenswood Avenue, Chicago 40, U. S. A.
Represented in Principal Cities (Consult Telephone Directory)
In Canada by Powerlite Devices, Ltd., Toronto, Ont.

S&C High Interrupting Capacity Disconnect Power Fuses incorporated within a typical magnetic, full-voltage, controller for 150 hp, 3-phase, 60-cycle, 2200 volt squirrel cage induction motors.

Get New Bulletin 242. Details modern motor short-circuit protection. Send for it today.

HIGH INTERRUPTING CAPACITY POWER FUSES

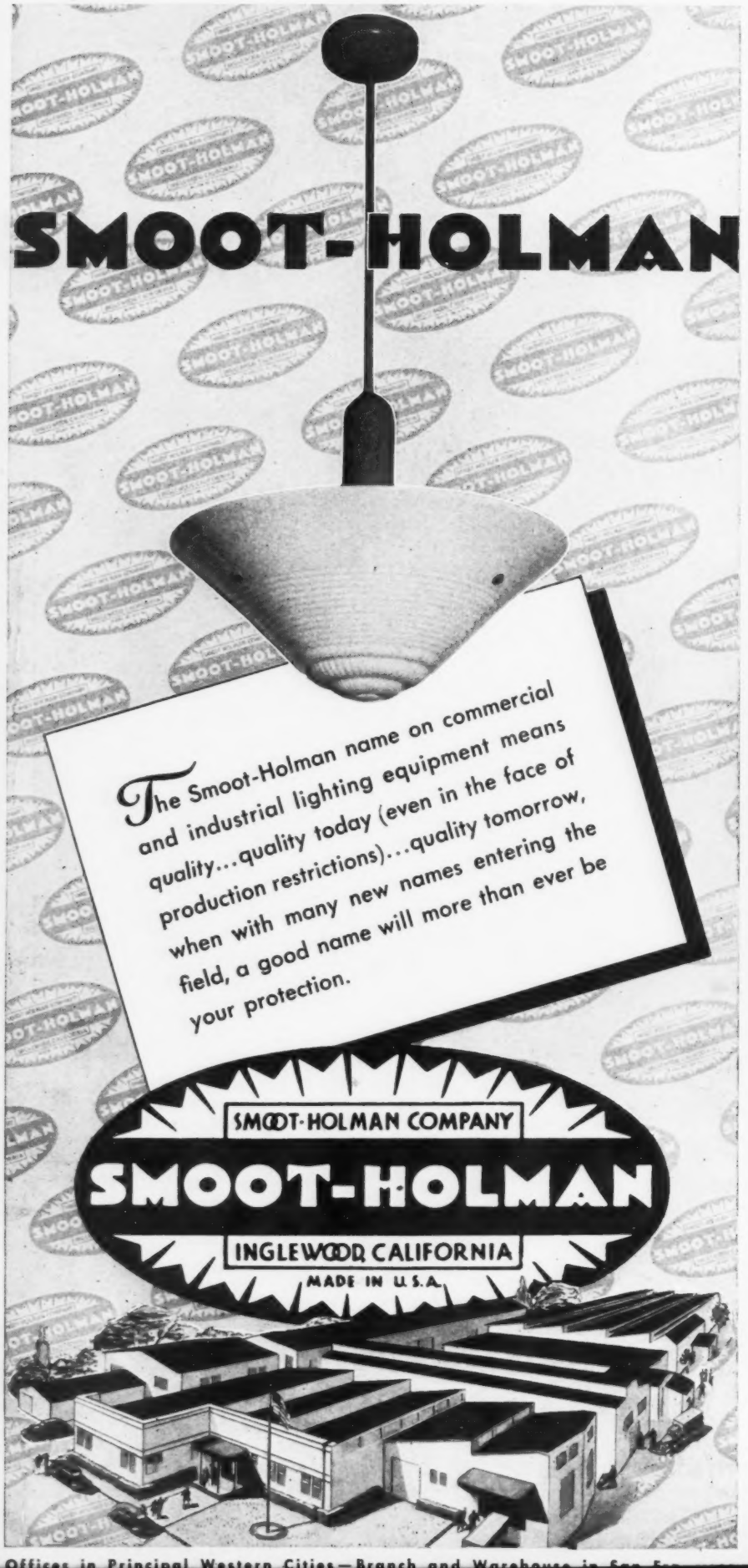
Dependable protection for high-voltage motors

WESTERN REPRESENTATIVES:

SAN FRANCISCO
George E. Honn, 420 Market Street
LOS ANGELES
Farnham & Cunningham, Edison Bldg.

SEATTLE
T. S. Wood, 220 Ninth Avenue, North
SALT LAKE CITY
Riter Engineering Co., Kearns Bldg.

BUY U. S. WAR BONDS AND HOLD THEM!


SMOOT-HOLMAN
The Smoot-Holman name on commercial and industrial lighting equipment means quality...quality today (even in the face of production restrictions)...quality tomorrow, when with many new names entering the field, a good name will more than ever be your protection.
SMOOT-HOLMAN COMPANY
SMOOT-HOLMAN
INGLEWOOD, CALIFORNIA
MADE IN U.S.A.

Offices in Principal Western Cities—Branch and Warehouse in San Fr

Ceramic Insulation (109)

To meet the shortage of electrical insulators for ultra-high frequency equipment, Westinghouse has developed a new type of ceramic insulation, it was announced recently. Known as Zircon porcelain, the material is said to have very low loss at ultra-high frequencies.

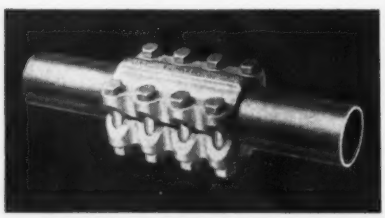
Tensile strength of Zircon is said to be some 37% greater than that of standard commercial, high-frequency porcelain insulation; compressive strength approximately 15% greater and transverse strength approximately 30% greater. Other features are moisture resistance and ability to withstand heat shock.

Zircon can be processed with standard equipment by any of the methods used for forming high-tension electrical procelain, it is stated. Zircon compositions can be selected to have total shrinkages identical with high-tension porcelains so that dies are interchangeable.

Characteristics of the material are said to provide a broad field of use by no means restricted to high-frequency applications. Although it generally is used for small parts, sizable pieces can be made where the application justifies a higher cost, it is stated.

Mineral Zircon is found in the sand on beaches in many parts of the world and is replenished by the sea. It is also a common constituent of many ingenous rocks.

Connectors (110)



A complete line of aluminum connectors has been announced by Burndy Engineering Co. Included are types and sizes for all aluminum-to-aluminum connections and for aluminum to copper, it is stated. A new design is said to compensate for differences in electrical and physical properties of the two metals and the high elongation of the aluminum alloy permits the connector to conform tightly to the conductor under pressure without danger of cracking.

Friction Brake (111)

An electromagnetically controlled friction brake has been designed by Westinghouse for airplane use. It is claimed that a d-c motor turning at 16,000 r.p.m. can be brought to a standstill in 1/15 second. The brake operates without disengaging the motor rotor from the load. On a special propeller-feathering motor, one of these brakes had to withstand an ambient temperature of 200° F. and a vibration of 50 times gravity imposed 240 times per second for 50 hours, it is stated.

Battery Charger (112)

General Electric is making a large capacity automatic copper-oxide battery charger for charging electric truck batteries. The charger has simplified controls and a d-c contactor. It is capable of charging 30 nickel-alkaline or 24 lead-acid battery cells, according to the announcement.

The Truck With a

$50,000,000.00 ENDORSEMENT

FWD's MODEL HAR

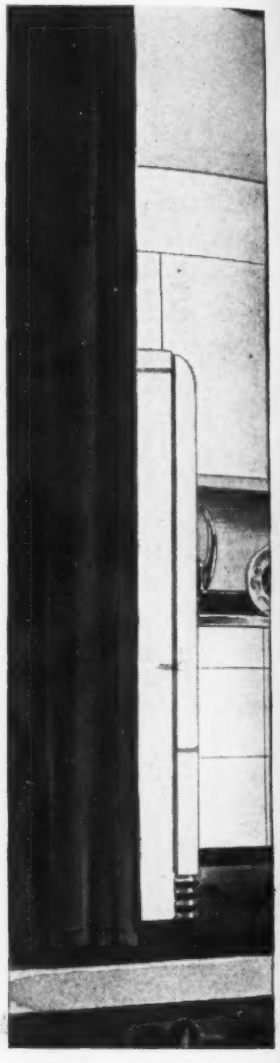
A truly great truck — the FWD Model HAR—a truck that in just four years has won the endorsement of motor truck users to a total of $50,000,000 in purchases of this single model—a truck that has achieved the phenomenal record of $50,000,000 in manufacturing experience in the comparatively brief span of 48 months.

Rated at 20,000 lbs. gross, the Model HAR embodies the highest development of the four-wheel-drive principle, pioneered and sponsored by FWD since 1910. Truck operators know that the true four-wheel-drive principle as applied in FWD's gives these trucks a basic mechanical advantage—qualifies them to get through regardless of road or weather—to go with greater safety — to perform year after year at lowest cost per ton mile — to conserve war-precious gas-oil-tires-replacements. When the call is for rugged, dependable trucks to provide vitally important motor transport, your confidence is well placed in FWD's.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin
Canadian Factory: KITCHENER, ONT.

FWD Distributors: FEENAUGHTY MACHINERY CO., Portland, Seattle, and Spokane—INTERMOUNTAIN EQUIPMENT CO., Boise, Idaho—STEFFECK EQUIPMENT COMPANY, Helena, Montana.

28 million future appliance customers invited to "The G-E House Party"!



Great, New Radio Show Goes on the Air for G-E Retailers January 15th, at 4 o'clock, E. W. T.

Art Linkletter, well-known Hollywood actor and producer, is the Master of Ceremonies for "The G-E House Party." You'll have to hear him to appreciate what a wonderful job he does of weaving the "sell" on appliances right into the show itself.

"THE G-E HOUSE PARTY," General Electric's brand-new radio show, is one of the most unusual activities ever undertaken in daytime radio programs . . . and one of the strongest promotions ever put on to build demand and future sales for electrical appliances!

This new show will be on the air over a nationwide CBS network reaching 28 million radio homes—not once a week, not three times a week—*but every day from Monday through Friday!*

And it's no 15 minute "soap opera" either . . . but nearly a full half-hour of big-time "variety" entertainment—the kind you'd expect to hear just once a week in an evening show!

New! Different!
Sure-fire for women listeners!

"The G-E House Party" is unique among radio shows today.

It's an "audience participation" program. It'll feature quizzes . . . games . . . contests . . . for *both* grownups and youngsters in the studio audience . . .

There'll be helpful service information for women listeners . . . answers to women's domestic and housekeeping problems . . . demonstrations of new appliances, new advances in electrical living . . .

All made into one smooth-running, delightfully entertaining program that's a natural for getting women listeners . . . and a natural for building business for the *complete line* of G-E Appliances!

"The G-E House Party" will be actually staged like this in a studio that holds 500 people. Notice that G-E Appliances are right in the stage setting. They're actually demonstrated as part of the "commercials," which are as lively and entertaining as the rest of the program.

It's *your* show!
It sells for *you*! Don't miss it!

Take 25 minutes of your time to tune in and listen to "The G-E House Party."

Find out what a terrific job it does in selling the complete electrical appliance idea . . . in building desire and preference for *all* the G-E Appliances you sell—from the smallest to the largest!

Ask your family to tune in, too! See if they don't agree that "The G-E House Party" is the kind of program they'd like to hear—not just once in a while—but *every day!*

General Electric Company, Appliance and Merchandise Department, Bridgeport, Conn.

TUNE IN
"The G-E House Party"

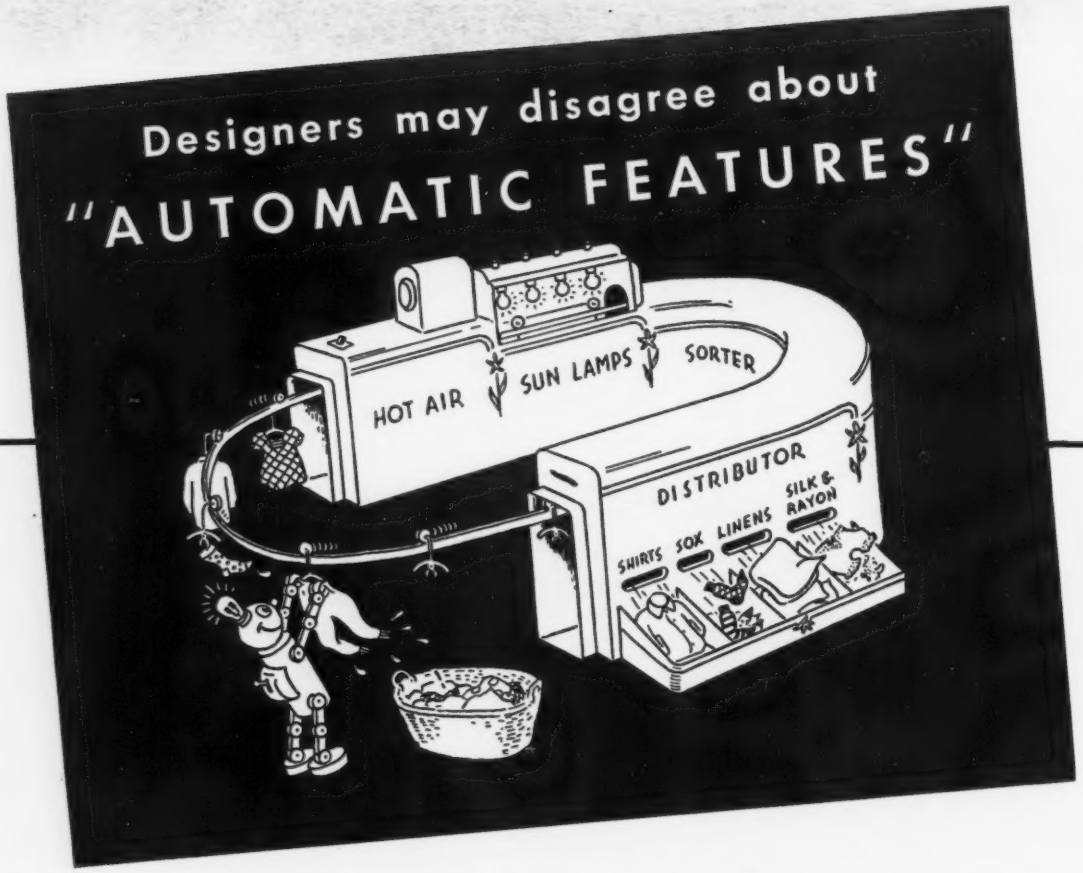
STARTING: January 15th

TIME: Every weekday, Mon. thru Fri., 4 to 4:25 p.m. E.W.T.

STATIONS: CBS NETWORK, 142 STATIONS. (See your paper for local station.)

GENERAL ELECTRIC

FOR VICTORY: BUY AND HOLD MORE WAR BONDS!



. . . but they all know a CLOTHES DRIER MUST HAVE GOOD INSULATION

Among the new products being developed for Postwar Homes, one of the most interesting is the *Clothes Drier* (which we can assure you will look nothing like the picture above).

Smart looking and compact, the new Clothes Driers will fit perfectly into the laundry, kitchen or utility room. They'll do an excellent job. They'll save time and effort. And they'll be well-insulated (so we hear) so that the heat used in drying will be kept inside the cabinet where it belongs.

Good insulation will pay dividends, not only in keeping the heat from getting out into the room, but in making possible lower operating costs, always a big point with homemakers.

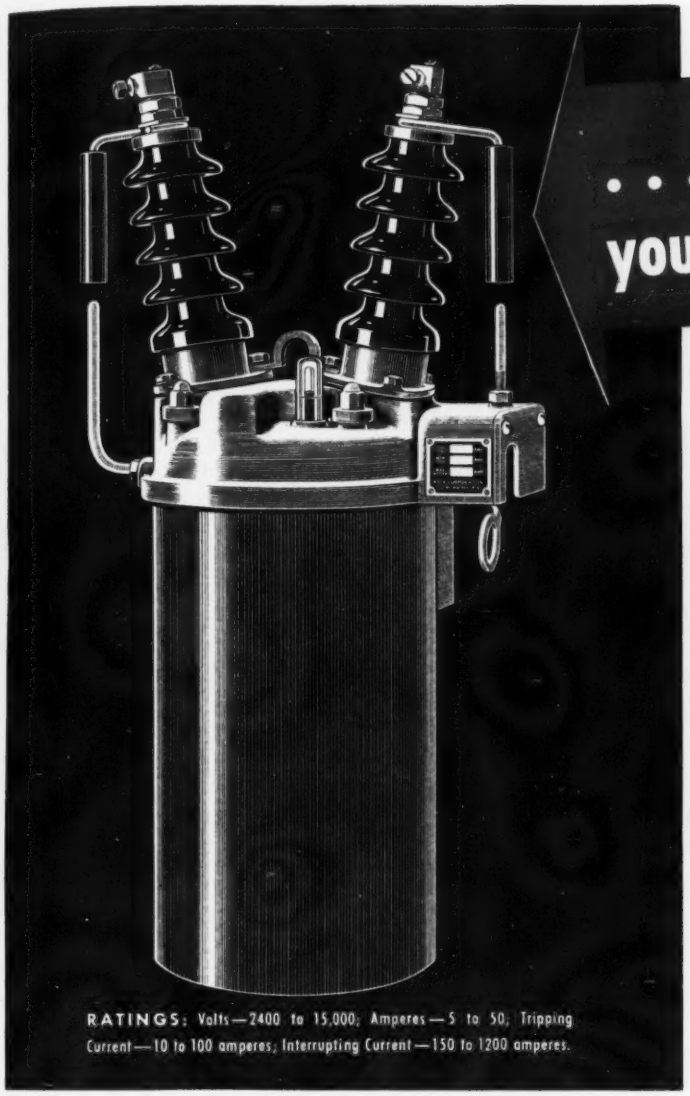
And if this insulation is Fiberglas*—and the odds are that it will be—you can stress the long, dependable and trouble-free service it will render. Being *inorganic*, Fiberglas is immune to rot and decay. Equally important, it is highly moisture resistant—picking up less than 1% by weight under extreme humidity conditions — and dries out without harm. It won't corrode — nor is it corrosive to aluminum or steel in the presence of moisture. Best of all, it won't settle or disintegrate — but "stays put" for life even when subjected to severe vibration.

Yes, Fiberglas will be a swell feature to sell in Clothes Driers, just as it has been—and will be again—in many other Home Appliances. *Owens-Corning Fiberglas Corp., 1981 Nicholas Bldg., Toledo 1, O.; Pacific Coast Office: 5120 S. Soto St., Los Angeles.*

ARMY E NAVY

FIBERGLAS THERMAL INSULATION

*T. M. Reg. U. S. Pat. Off.



RATINGS: Volts—2400 to 15,000; Amperes—5 to 50; Tripping Current—10 to 100 amperes; Interrupting Current—150 to 1200 amperes.

. . . . Here is the Recloser you have been waiting for

NEW TYPE "H". . . .

KYLE

AUTOMATIC OIL CIRCUIT RECLOSER

FULLY MEETS ALL LINE PROTECTION REQUIREMENTS

DUAL OPERATING CHARACTERISTICS GIVE YOU . . . TWO FAST OPENINGS to clear all temporary faults
TWO TIME DELAY OPENINGS to isolate branch lines and keep main lines open

The New Type "H" Kyle Automatic Oil Circuit Recloser is the line protection unit you have always wanted—*ONE* Recloser with operating characteristics to meet *EVERY* line protection need.

The Kyle Oil Circuit Recloser is entirely automatic in its operation. It provides a fast opening on the first and second operations. This is followed by time delay openings on the third and fourth operations.

Temporary Faults are cleared by the fast operations of the Recloser without damage to sectionalizing fuses.

Permanent Faults are isolated by time delay operations of the Recloser.

Coordination With Sectionalizing Fuses is possible on the time delay operations of the Recloser. Faults can be isolated before the Recloser locks open by blowing the sectionalizing fuse while service is continued on the remainder of the system protected by the Recloser.

Coordination Between Two Or More Reclosers in series is possible when installed on long rural lines. In addition, sectionalizing fuses beyond any of these Reclosers permit the isolation of any branch line upon which a permanent fault exists.

Ask your Line Material Representative for full information on the New Type "H" Kyle Automatic Oil Circuit Recloser. Let him show you how its use will save you revenue, time and manpower . . . will keep the main lines in operation.

MADE BY KYLE CORPORATION SOUTH MILWAUKEE WISCONSIN

KYLE Circuit Breakers are Designed and Manufactured for LINE MATERIAL COMPANY

NOW AVAILABLE
Collyer
VARNISHED CAMBRIC CABLE
BRAIDED & LEAD SHEATHED
Collyer Varnished Cambric Cable is well known for its high dielectric strength and resistance to heat and oil. Cables having this insulation require less space, and due to higher safe operating temperatures carry a heavier current load for a given copper conductor.
For full information, contact the nearest Collyer representative or write us direct.
Collyer
INSULATED WIRE COMPANY
ALLIED INDUSTRIES, INC.
LOS ANGELES
SAN FRANCISCO
SEATTLE
255

New Blade Construction (113)

Westinghouse has announced a new turbine blade construction, which it claims can withstand heavier duty than present blades. The root of each blade is shaped like an inverted U. Three blades are brazed together, forming one solid segment which fits into circumferential grooves in the spindle. With the segments in position, holes are drilled crosswise through the rotor and through edges of two adjoining segments. Pins are then driven through these holes and the ends peened.

According to the announcement, any segment of three blades can be removed directly without disturbing any other segment. The blade is 1½ in. wide by 2 in. deep as compared with 2 by 3½ in. for the present multiple-fit blade.

Binding Post (114)

Cole Instrument Co. is making a heavy-duty all-metal binding post for the manufacture and assembly of electrical instruments and equipment. This device is available in both standard and special sizes.

The 1,000-amp. binding post has a stud length of 3⅛ in.; diameter of ⅝ in.; nut diameter of 1½ in. and over-all height above panel when closed is 1½ in. The 100-amp. post is 1¾ in. long; ¼ in. in diameter; has a nut diameter of ¾ in.; height above panel when closed is ¾ in. Intermediate sizes can be made to order with studs in any length desired and special shapes or designs can be furnished, the manufacturer states.

Explosion-Proof Motor (115)

Warren Telechron Co. has developed an explosion-proof motor, which it states can be supplied in various shaft speeds, voltages and frequencies. This motor is totally enclosed in a bronze casting with removable screw cover and is adapted for explosion-proof conduit mounting.

According to the announcement, it was designed primarily for use in connection with automatic controls used in industrial processes where there are atmospheres containing ethel ether vapor, gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vaports and natural gas.

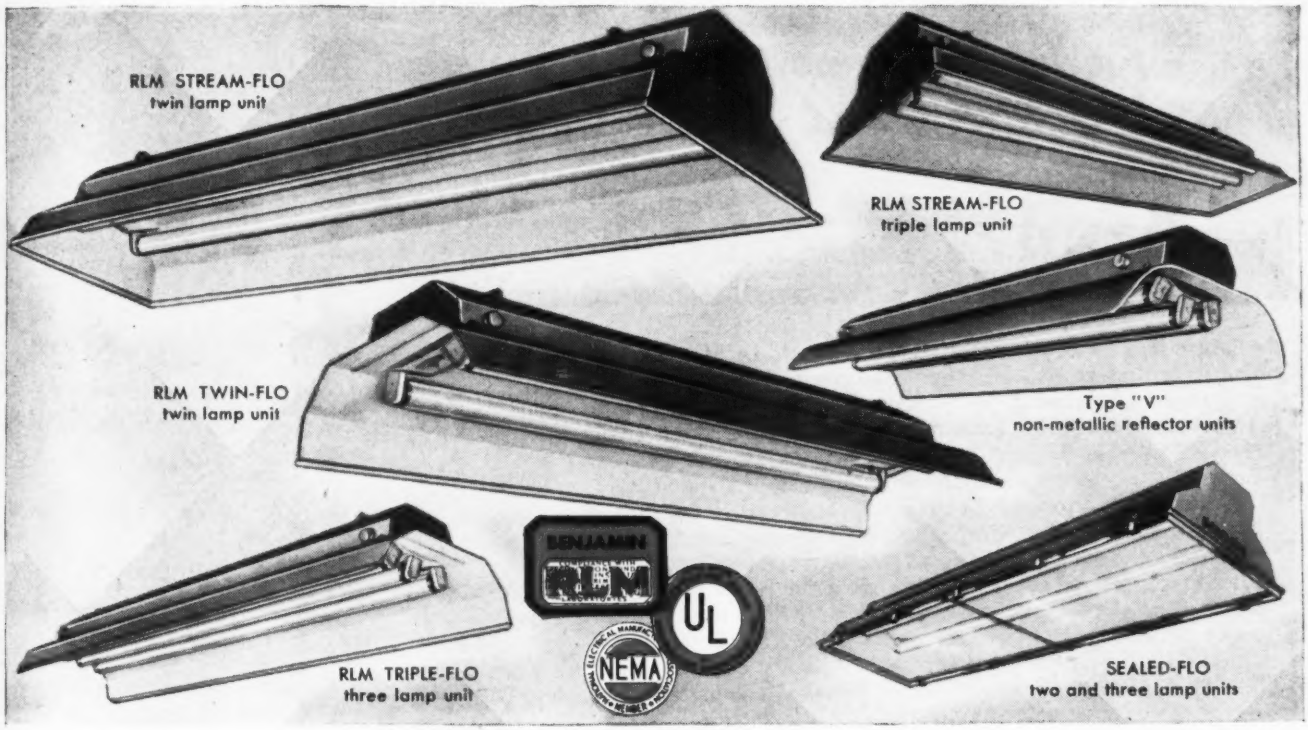
Signal Generator (116)

Radio City Products Co. has a new signal generator with range from 95 kilocycles to 100 megocycles. According to the announcement, fundamental frequencies are continuously variable from 95 kilocycles to 25 megacycles in five bands; calibration is accurate to 2% per band up to the broadcast band and within 3% for high-frequency bands. The new model, No. 704, has a planetary drive condenser with direct reading calibration. Output can be modulated or unmodulated. Self-contained modulation is either 400 or 1,000 cycles sine wave, which modulates carrier.

Terminator (117)

O. Z. Electrical Mfg. Co. has announced a dual-purpose terminator for use either as a terminator and sealing fitting or as a pulling or splicing chamber. According to the manufacturer, the device permits sealing and terminating conduits and cables outside of chambers without disturbing electrical installations. Available in sizes to accommodate conduit from 1 to 4 in.

Again Available . . . Benjamin Porcelain Enamel Steel Fluorescent Units



• Again obtainable*, are Fluorescent Lighting units which meet the highest specifications for efficiency, durability, long life and ease of maintenance.

For Benjamin RLM Fluorescent Lighting units with Benjamin *Life-Time porcelain enamel steel* reflectors are back in production! Now, again, you can secure the unequalled advantages of fluorescent lighting with porcelain enamel** light reflecting units.

Not only do these units bring to you the extra safety factor of strength and durability insured by Benjamin's "built-like-a-battleship" construction; *the ease of installation and maintenance* features which have long identified Benjamin with economy and lower over-all cost; but also they bring you the latest developments in trouble-free and more efficient auxiliary equipment.

**Subject to existing priority regulations.*

WRITE TODAY FOR NEW BULLETINS containing complete descriptions and data on the various Benjamin RLM Fluorescent Units now available. These include Twin and Triple Lamp closed and open-end units for both 48" and 60" fluorescent lamps; also, the Benjamin dust-tight and vapor-tight fluorescent units and the Type "V" non-metallic reflector Fluorescents. Write Product Information Department J, Benjamin Electric Mfg. Co., Des Plaines, Illinois.

***Experience has proven that there is no substitute for the strength, durability, high light output, diffusion and sustained lighting efficiency of porcelain enamel. It cannot decompose, oxidize or disintegrate. It is impervious to practically all atmospheric conditions obtaining in Industry. Its glass-hard surface cannot be penetrated by dirt nor grime nor worn away by repeated washings. It is the easiest of all reflecting surfaces to clean . . . soap and water quickly restoring it to its original light reflecting efficiency.*

BENJAMIN TRADE MARK

Lighting Equipment

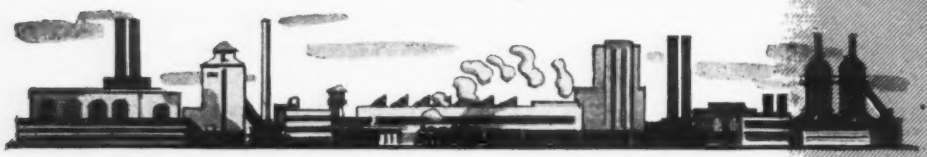
Distributed Exclusively Through Electrical Wholesalers

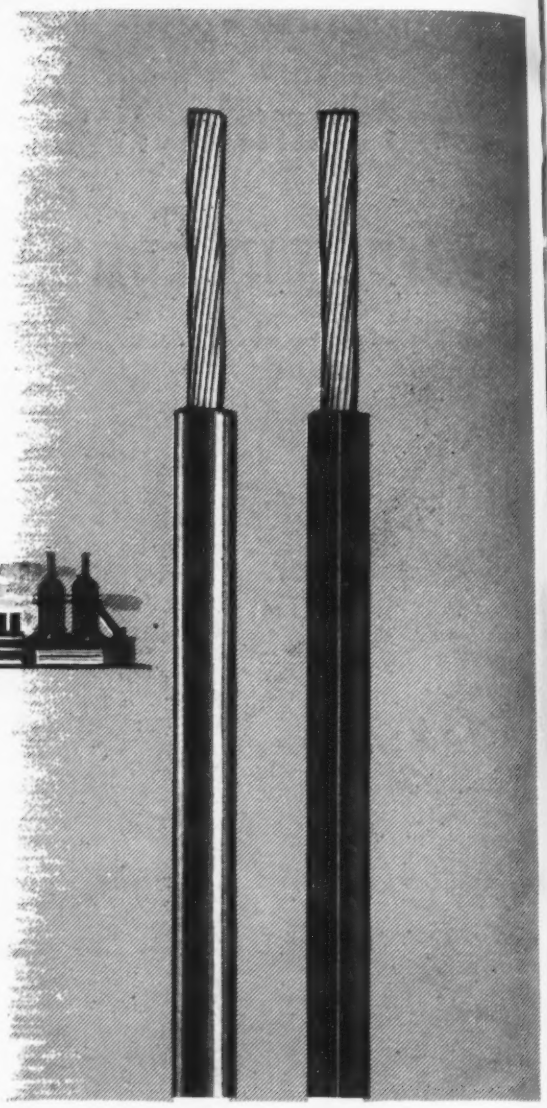
Flamenol*

BUILDING WIRE

(SMALL DIAMETER)

- FOR COMPLETE WIRING SYSTEMS
- FOR RECONVERSION WIRING
- FOR WIRING EXTENSIONS
- FOR MAINTENANCE





Type SN for General Purpose Wiring

Type SNW for Wiring in Wet Locations

Here is a small diameter thermo-plastic insulated building wire that is sure to meet the requirements of any job you may be handling. It is available in two types in sizes 14 to 2,000,000 CM: Type SN for general purpose wiring; Type SNW for wiring in wet locations. Both types can be used for feeders, branch circuits or special wiring.

The insulations of both Type SN and Type SNW Flamenol wire have long life, are high in dielectric and mechanical strength and are resistant to oils, acids and alkalies. Type SNW Flamenol wire has a low moisture absorption rate. The small diameters of both wires enable more conductors to be used in conduits and ducts. Lubricated finish aids wire pulling.

*Reg. U.S. Pat. Off.

For Further Information on Flamenol Building Wire, G-E conduits or wiring devices, see your G-E Merchandise Distributor or write to Section CDW153-18, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

BUY WAR BONDS AND HOLD THEM

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

G-E CONDUITS AND WIRING DEVICES

General Electric also offers five conduits and a full line of wiring devices including: White and Black rigid conduits, EMT, flexible metal conduit, Fiberduct; and switches, fuses, lampholders, outlets, etc.

AIDS SOUNDNESS FOR LONG-TERM INVESTMENT

Victor W. Hartley, managing director of the Pacific Coast Electrical Association, Inc., Los Angeles, Calif. says on adequate wiring: "Wiring is a 'hidden value.' Upon its adequacy depends, in a substantial degree, not only the modern quality of the structure, but its soundness as a long-term investment."

ADEQUATE WIRING SERVES NOW AND LATER — THE KEY TO THE HOME OF TOMORROW

GENERAL ELECTRIC

A SPOT AUTHORIZATION

Has us on the Spot!

● Yes, we've been authorized to make a limited quantity of lamps and shades. And, apparently, most of our friends have heard about it. As a result, we've had to write a lot of letters like this . . .

Railley CORPORATION
6611 EUCLID AVENUE
CLEVELAND 3, OHIO

Dear Customer:

We appreciate very much your recent inquiry. It is true that we have received spot authorization to manufacture lamps and shades. However, that is just the beginning.

First, it may be several weeks before we will know when material necessary to their production will be available to us. Then, too, our number one commitment, not to mention our duty, is still to the Armed Forces for whom we are producing Gas Capes, Practice Cartridges, Sub-assemblies for the Field X-Ray Unit, and Rocket Motors.

Needless to say, we are eager to serve you, and will do so as soon as we possibly can. In the meantime, please bear with us until we have a definite indication of when that opportunity will arise. Then, you will hear from us.

IF WORK WILL WIN, WE'LL WIN

RAILLEY CORPORATION

Vice President in Charge of Sales.

ARMY E NAVY

Railley
CORPORATION · CLEVELAND, OHIO
ORIGINATORS OF THE
PIN-IT-UP LAMP

NOW MAKING FOR VICTORY — X-RAY PARTS · GAS PROOF COVERS
ROCKET PROPULSION UNITS · DUMMY FUZES · PRACTICE CARTRIDGES

The Starter that

Clicked With the Trade!

Lloyd New Automatic Starter

In the *New* RED PLASTIC Can

Tomorrow's Starter Today!
New! Distinctive!
Listed and Approved by Underwriters' Laboratories, Inc.
Submitted to Electrical Testing Lab., Inc., for certification.

Pat. Nos. 2200443—2228210

Locks Out . . . Resets AUTOMATICALLY

1. Positively cuts out deactivated, flickering, blinking lamps.
2. When trouble is detected the starter automatically cuts off current to the ballast and lamp.
3. Gives long life to ballast because defective lamp is locked out. Prevents overheating.
4. When Lloyd AUTOMATIC locks out defective lamp—turn off the current—Remove defective lamp—Put in a new lamp.
   Allow at least one minute to make the above change of lamps. Turn on the current. The starter automatically lights the new lamp.
   NO NEED TO DO ANYTHING TO THE STARTER
5. Lloyd NEW PLASTIC CAN has higher dielectric strength, is stronger, lighter, distinctive.
6. Knurled rim on plastic can insures positive grip for insertion and removal of starter.
7. Plastic can is sealed. No projecting lugs to cause trouble.
8. The life of the AUTOMATIC starter is many times greater than that of the average lamp.
9. It saves maintenance costs and power consumption, protects and insures longer life to the ballast and lamp.
10. Tested in production and prior to shipment to insure perfect performance.

LLOYD PRODUCTS COMPANY
Dept. EW-1 Providence 5, R. I.
Representatives in 23 Leading Cities.
Export Office: 13 E. 40th St., N. Y. C.

BULLETINS

data books, etc.

Cable Entrances (118)

Through type, compound filled cable terminators or potheads are described and dimensions are given in a new Delta Star Electric Co. publication. Five types of cable entrance with wiping sleeves, for conduit stuffing boxes, for braided or lead covered cable and mechanical conduit entrance are furnished.

Insulation (119)

Fiberglas electrical insulation materials are described in a new 23-page catalogue. Sections include data on yarns, wire, tapes, cordage, braided sleeving, cloth, varnished cloth and tape, mica combinations, laminates, saturated sleeving and varnished tubing.

Insulation Sheets (120)

Electronic Mechanics, Inc., has a new bulletin containing information on its Mykroy, mica ceramic insulation in sheets. Included is a report on the company's new larger size sheet, which is 19¼ x 29¾ in., with thickness ranging from ⅛ to 1½ in.

Tachometers (121)

Individual-mount tachometers and a multi-range portable tachometer are described in a pamphlet published recently by the Jones Motrola Co. Included are sections on use and operation, and general installation data.

Control Devices (122)

Clarostat Mfg. Co. has issued an "interim line" catalogue listing switches, controls, etc., in regular production and which may be made available to jobbers, providing priority requirements are met.

Hospital Signals (123)

Hospital signaling systems are discussed in a 35-page bulletin being distributed by the S. H. Couch Co. Calling stations, annunciators, corridor lights, fire alarm signals are listed and pictured.

Assemblies (124)

Union Aircraft Products Corp. has prepared an illustrated booklet on electrical assemblies. Also included is a catalogue section on aluminum junction boxes.

Switches, Relays (125)

Automatic Switch Co. has prepared a booklet on its automatic transfer and remote control switches, contactors and relays. Illustrated.

Synthetic Rubber (126)

A product information letter on synthetic rubber has been prepared by General Cable Corp. as a supplement to its catalogue.

At your service!

CROUSE-HINDS

international distribution system

CONDULETS, made only by CROUSE-HINDS, are stocked by hundreds of **electrical wholesalers,** backed up by a large staff of Crouse-Hinds product engineers at **22** offices and **4** other strategic locations in the U. S. A.; the Crouse-Hinds Company of Canada, Ltd., in Canada; **22** Crouse-Hinds agents in Latin America.

There is an **electrical wholesaler** representing CROUSE-HINDS near you, ready and eager to render assistance in handling CONDULET problems. Call on him frequently.

CROUSE-HINDS COMPANY

SYRACUSE 1, N. Y., U.S.A.

Offices: Birmingham—Boston—Chicago—Cincinnati—Cleveland—Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee—Minneapolis New York—Philadelphia—Pittsburgh—San Francisco—Seattle—St. Louis—Washington. *Resident Product Engineers:* Albany—Atlanta—Charlotte—New Orleans

CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

We can all see with the naked eye that the Payroll Savings Plan provides the most stable method of war financing. Analyze it under the X-ray of sound economics and other important advantages are evident.

A continuous check on inflation, the Payroll Savings Plan helps American Industry to build the economic stability upon which future profits depend. Billions of dollars, invested in War Bonds through this greatest of all savings plans, represent a "high level" market for postwar products. Meanwhile, putting over Payroll Savings Plans *together* establishes a friendlier relationship between management and labor.

To working America the Payroll Savings Plan offers many new and desirable opportunities. Through this systematic "investment in victory," homes, education for their children and nest eggs for their old age are today within the reach of millions.

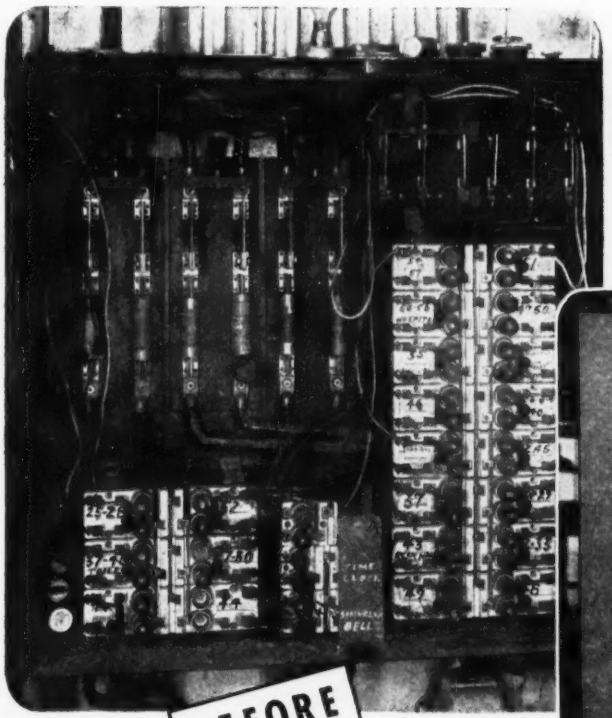
The benefits of the Payroll Savings Plan to both management and labor are national benefits. Instilling the thrift principle in the mind of the working men and women, the Payroll Savings Plan assures their future security—and is a definite contribution to the prosperity of postwar America!

The Treasury Department acknowledges with appreciation the publication of this message by

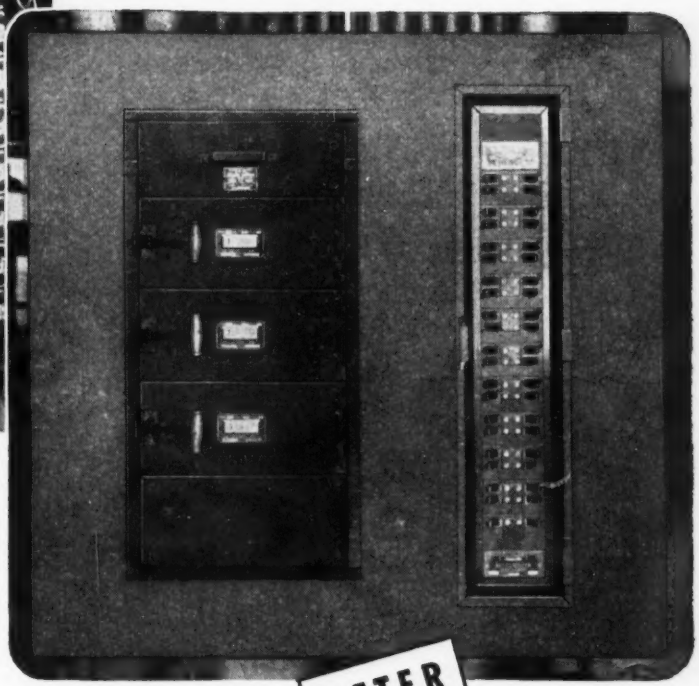
ELECTRICAL WEST

This is an official U.S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council.

No Plant Too Large *or too small* To Profit by this SQUARE D *Conversion Plan!*



BEFORE



AFTER

● Panelboards, taxed beyond their efficient capacities, are a drain on the productivity of any plant — regardless of its size. This speedy Conversion Plan involves such a moderate investment that it "pays off" in a hurry, even in the smallest plant.

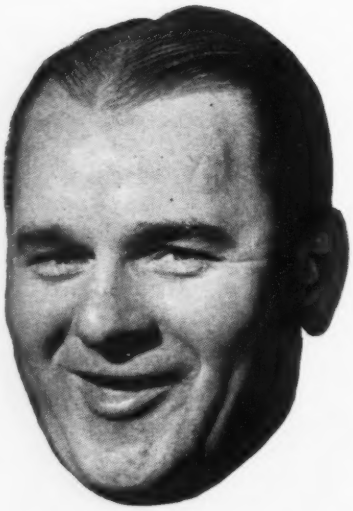
The pictures above show a typical conversion. With a minimum of time and labor and at no increase in space, 25 lighting circuits were increased to 42—up 68%. Circuit breaker convenience and protection replaced obsoleted fusible circuits. Notice, too, that Saflex units were installed for the main controls, with sufficient space provided for an additional circuit, if and when it is needed.

Remember, such conversions as these utilize existing boxes and conduit. The cost in time and money is small. The dividends in conserved power and increased efficiency are substantial. Your nearby Square D Field Engineer will be glad to analyze your present equipment and submit a tailor-made conversion plan for your consideration. This service costs nothing—pays big dividends.

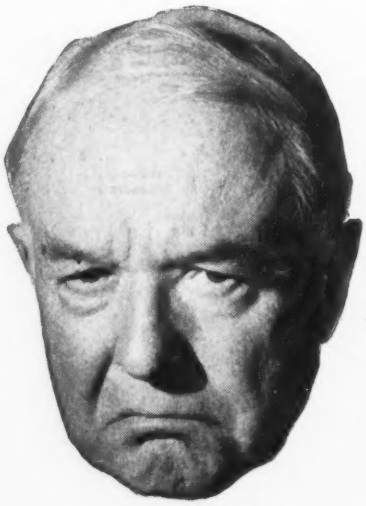
Write for a free copy of "MORE CAPACITY" which shows a variety of conversions in detail. Address Square D Company, 1318 East 16th Street, Los Angeles 21, California.

SQUARE D COMPANY

LOS ANGELES • DETROIT • MILWAUKEE



"I'll tell you GOOD TIMES ARE COMING!"



"I'll tell you BAD TIMES AHEAD!"

What's it to you?—PLENTY!

OKAY! Maybe the optimists are right. There'll be good times after the war.

OKAY! Maybe the pessimists are right. We'll have another depression.

What's it to you? PLENTY! It's largely in *your* hands as to which we'll have.

The one way to make it *good times* is to do your share to help keep prices down now!

That means *buying only what you really need.* It means *paying off your debts, saving your money.*

And here's where you're lucky. The same program that helps insure prosperity is also the best possible way to get yourself in shape to take another depression if one does come. So what? *You're right both ways*—if you save your money. *You lose both ways*—if you splurge right now.

Think it over, fella. Then get in there and fight. Read—and observe—the four rules to head off inflation. The war isn't over yet. And the war against *inflation* isn't over yet—by a long shot. Remember World War I? The cost of living rose twice as fast *after* the war as it did during the war itself.

4 THINGS TO DO to keep prices down and help avoid another depression

1. Buy only what you really need.

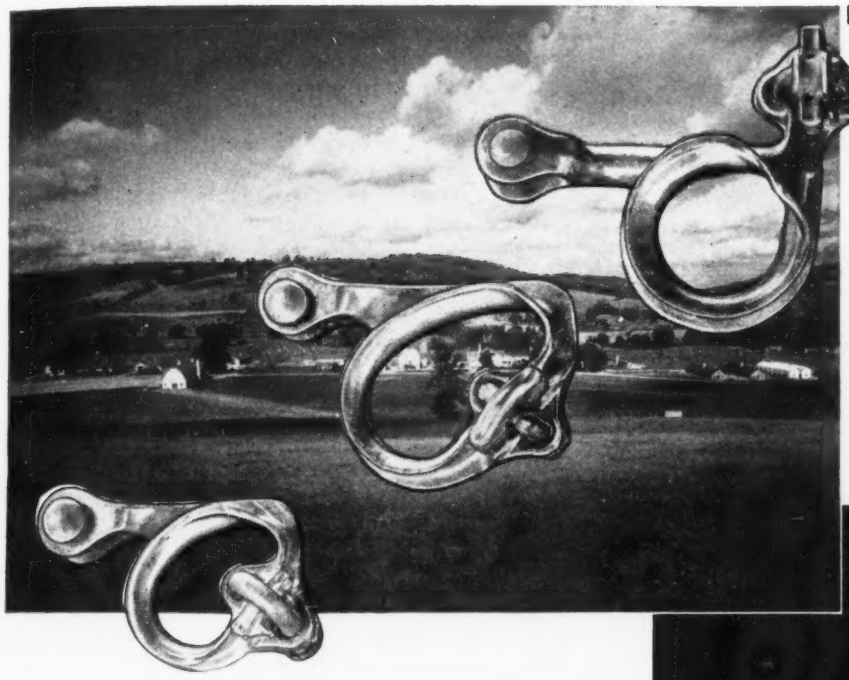
2. When you buy, pay no more than ceiling prices. Pay your ration points in full.

3. Keep your *own* prices down. Don't take advantage of war conditions to ask more for your labor, your services, or the goods you sell.

4. *Save.* Buy and hold all the War Bonds you can afford—to help pay for the war and insure your future. Keep up your insurance.

A United States War message prepared by the War Advertising Council, approved by the Office of War Information, and contributed by this magazine in cooperation with the Magazine Publishers of America.

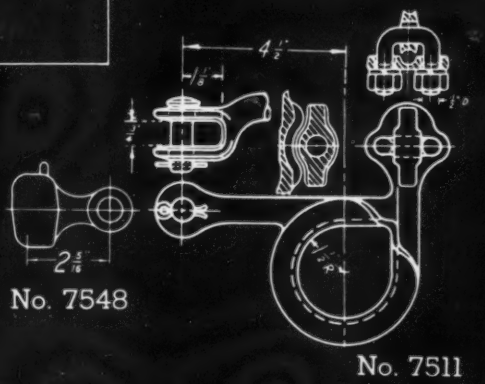
For Rural & Light Transmission Lines



These are the familiar and accepted snubbing type, designed for dead-ending the lighter duty transmission and distribution lines. Low in price, they are especially adapted to rural electrification and light transmission work.

The use of forged steel parts results in a light-weight clamp with more than adequate strength. This feature, together with the short connection length, protect the conductor from the possible effect of vibration.

The ample radius of snub, smooth cable seat and long clamping keeper prevent damage to the conductor and the side opening type is easy to install and work with hot-line tools. Reversible two-groove keepers accommodate a wide range of conductor sizes.



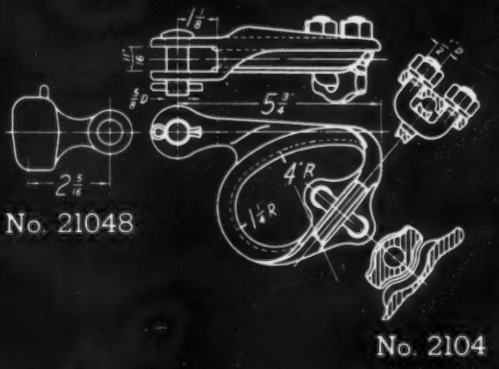
No. 7548

No. 7511

No. 7511 (without fitting). No. 7548 (with socket eye).
For all conductors within its size range.
Min. 0.16—Max. 0.55.

Not recommended for A. C. S. R. conductors larger than No. 2-0 due to their stiffness.

Ultimate strength 10,000 lbs. Shpg. wgt. 280 lbs. per C.



No. 21048

No. 2104

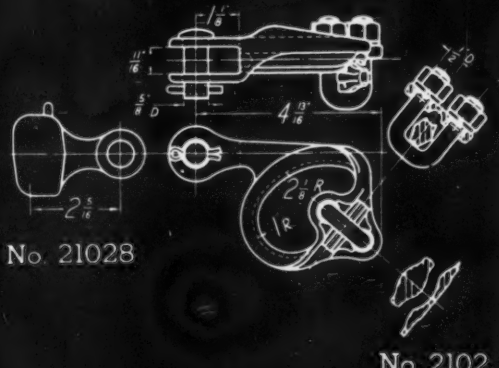
No. 2104 (without fitting). No. 21048 (with socket eye).
For all conductors within its size range.
Min. 0.187—Max. 0.50.

Ultimate strength 9,000 lbs. Shpg. wgt. 200 lbs. per C.

No. 2102 (without fitting). No. 21028 (with socket).
For all conductors except A. C. S. R. within its size range.
Min. 0.128—Max. 0.375.

Ideal for the popular A series Copperweld-copper or other similar three-strand composite conductors.

Ultimate strength 7000 lbs. Shpg. wgt. 145 lbs. per C.



No. 21028

No. 2102

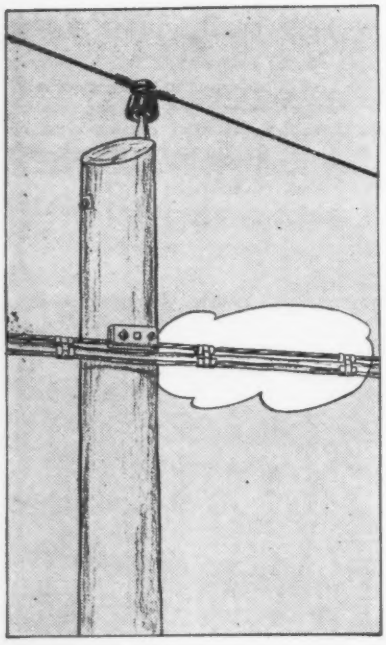
BTC

Through Your Insulator Manufacturer Only

Drop Forged Hi-Line Hardware

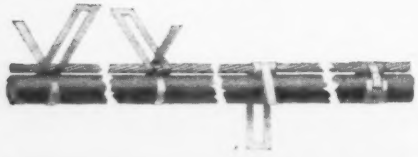
THE BREWER-TITCHENER CORPORATION
CORTLAND, N. Y.

Reduce Outages
Avoid Cable Wear
Reduce Maintenance



RELIABLE CABLE HANGERS

Prolong life of cables and conserve strategic materials by eliminating wear on cable sheaths or on insulation of hand made cables. Reliable cable hangers hold cable and messenger together tightly with wide bearing surfaces which eliminate snaking and chafing. They are easily applied and make installations that are permanent and very neat



Reliable
ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE • CHICAGO, ILLINOIS

Lighting Maintenance (127)

"Hints on Lighting Maintenance" is a 26-page pocket-sized booklet published by the Westinghouse plant lighting committee and lighting division. Covering cleaning, relamping, inspection and repair, the booklet tells how to use the light meter to determine when to clean; how to clean under various conditions; how to plan a cleaning schedule; what to look for during inspection; how to reduce maintenance time by use of access equipment. Also included are suggestions for safety; correct voltage for efficient lighting; use of paint to improve seeing conditions in various locations; simplified testing methods; maintenance check charts. Illustrated.

Signals (128)

The Faraday line of electrical signals is described and pictured in a 103-page catalogue prepared by Faraday Electric Corp. Suggestions for selecting signal equipment for various applications, location, and other installation data are included, as are engineering data, wiring diagrams, tables of electrical characteristics. The catalogue is well illustrated and contains a quick-finding index down the edge of each page.

Iron Core Data (129)

Henry L. Crowley & Co. has prepared a new catalogue containing high-frequency iron core data for designers and builders of radio and electronic equipment. Included are uses and functions of powdered iron cores; permeability and "Q" of various materials at different frequencies; effects of the addition of adjusting screws; copper cores; mechanical considerations, standard pieces and sizes; special cores.

Hand Tool (130)

A four-page bulletin describing its high-speed electric hand tool has been prepared by the Precise Products Co. Designed to operate at 35,000 r.p.m, the tool develops 1/6 hp., weighs 35 oz.

Welding Standards (131)

A booklet defining resistance welding equipment standards has been published by the Resistance Welder Mfg. Assn. The booklet deals with nomenclature, definitions and quality of equipment and includes a chart of electrodes to be used for spot welding similar and dissimilar metals, tables of equivalent ratings, limits of transformer temperature rise, etc.

Your being right up to the minute may have an important bearing on your success postwar. Announcements of developments to come with reconversion are appearing now in your field—tools which will help you to do a better job. Manufacturers' publications are a quick, efficient way for you to keep posted on current events in the industry.

Isn't it a bargain to invest 1c (the cost of a postcard) to help you keep abreast of new designs and methods; of improved models? American industry is offering a remarkable service—free. ELECTRICAL WEST makes it easy for you to secure this service. Check and mail coupon below. That's all you have to do to bring this information to you.

U-Tube Meter (132)

Cochrane Corp. has released a bulletin on its tilting U-Tube mechanical type meter.

Motors (133)

Warren Telechron Co. has issued a bulletin on its synchronous motors, instrument movements, gear trains and industrial clock equipment.

Hospital Lighting (134)

In a 26-page bulletin recently released, Holophane Co. discusses hospital lighting and shows its line of equipment for this purpose. Listed are lighting requirements for the several hospital areas, the text being supplemented by diagrams, sketches and installation photographs.

ELECTRICAL WEST, 68 Post St., San Francisco, 4, California

Please send me information about following CIRCLED items:

100 101 102 103 104 105 106 107 108 109 110
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133 134

Name..... Company*..... Title*.....

Address.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

$1,000,000 WORTH OF

New Design

As a part of Universal's own "U" Plan for "V" Day, a million dollars is being expended at the plant to redesign the entire Universal line. Under inspired leadership, an expert staff working in six laboratories is applying extensive research to consumer needs. Skilled designers are combining their talents with those of several of the country's outstanding product design groups... streamlining models for sales appeal... simplifying construction for greater utility... adding new features to meet tomorrow's demands for better living.

WHAT IT MEANS TO YOU!

Universal's reputation has been built primarily on quality, but in the coming competitive period dealers will need not only quality but smartness of design, unique features and new products to broaden markets and increase profits. We guarantee that Universal quality will be maintained. Those who have previewed Universal's post-war products are certain the million dollars for new design is being well spent... forecasting appliance leadership for Universal distributors and dealers.

Add to these factors three million dollars worth of new manufacturing facilities, fifty million customers worth of good will and you gain some idea of the true value of the Universal franchise in your community. *Write or call your nearest Universal distributor for full franchise information. Plan today to join Universal's "Forward March to Market".*

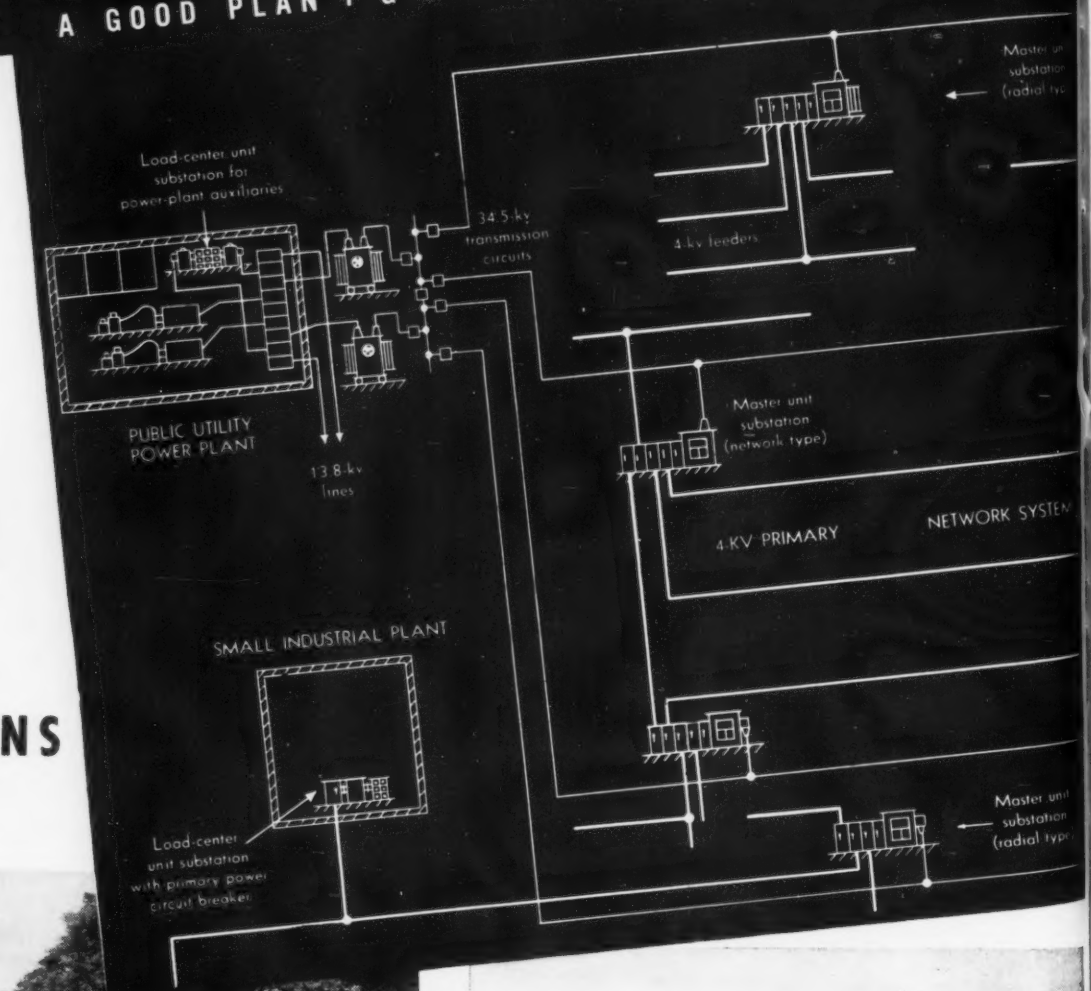
UNIVERSAL

LANDERS FRARY & CLARK · NEW BRITAIN · CONNECTICUT

Universal Electrical Appliances distributed in Canada exclusively by Northern Electric Company, Ltd.

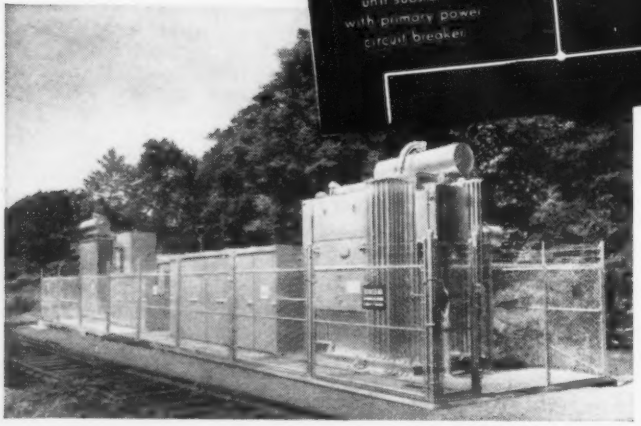
TO MAKE YOUR OVER-ALL SYSTEM PLANNING
Standard unit substations eliminate

A GOOD PLAN + G-E UNIT SUBSTATIONS = BETTER


Load-center unit substation for power-plant auxiliaries
34.5-kv transmission circuits
4-kv feeders
PUBLIC UTILITY POWER PLANT
13.8-kv lines
Master unit substation (network type)
4-KV PRIMARY NETWORK SYSTEM
SMALL INDUSTRIAL PLANT
Load-center unit substation with primary power circuit breaker
Master unit substation (radial type)

GE

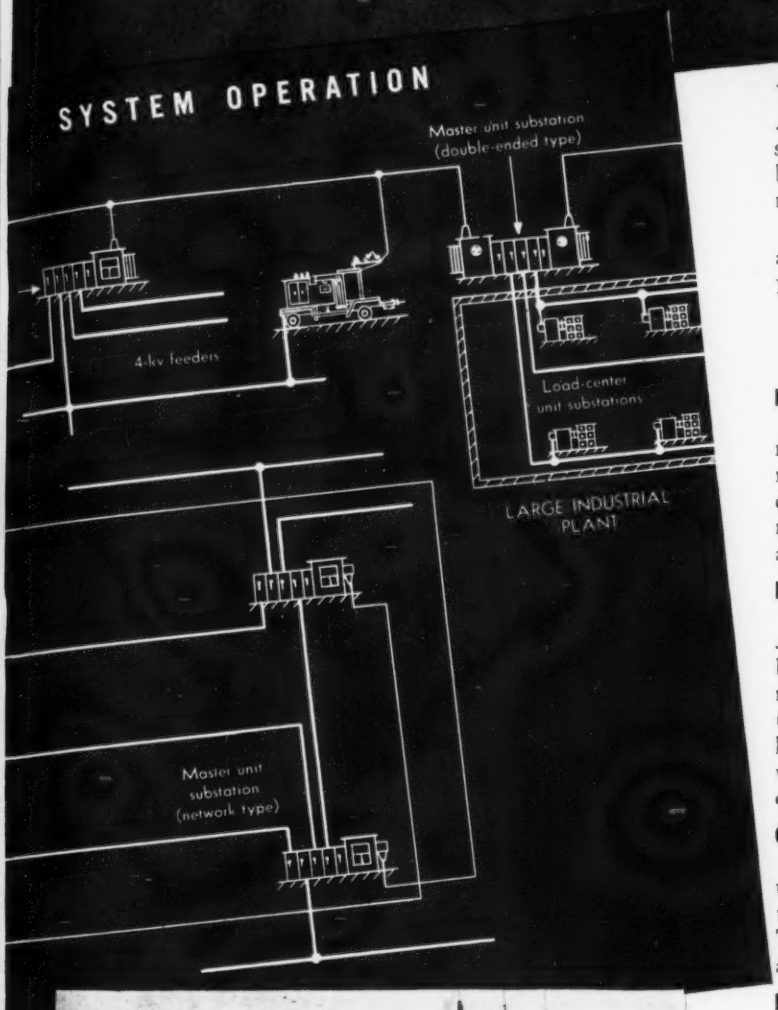
UNIT SUBSTATIONS

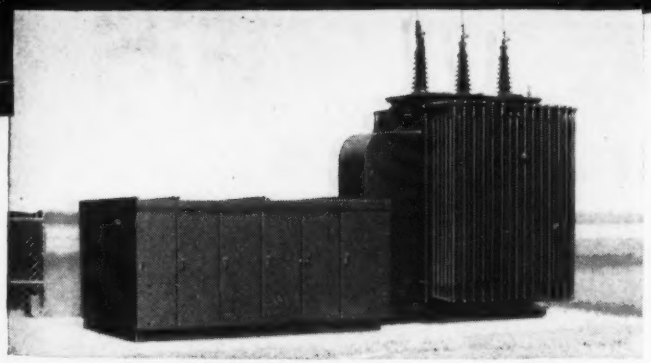


A flexible arrangement which allows breaker units to be added as the load grows—without disturbing existing equipment. If the load shifts, these substations can be moved easily to the new load centers.

Two master unit substations installed in one location to provide duplicate transformers and subtransmission feeds for the feeder bus.

EASIER . . .
many worries about equipment details





Catalog numbers make the ordering of unit substations easy. Hundreds of *complete substations* are now listed by catalog number.

MANY operating companies have found that by using repetitive-manufacture* unit substations in their systems, instead of building equipment piecemeal, they have been able to devote time thus saved to the more important matter of over-all-system engineering.

This approach to system improvement, together with the advantages afforded by co-ordinated unit substations, enables you more easily to:

1. Reduce capital investment
2. Provide better continuity of service
3. Insure greater flexibility of the system

Lower Capital Investment

Standard unit substations make it possible for you to modernize or expand your system economically. You can reduce your capital investments when additional substation capacity is needed by adding that capacity in smaller increments. This procedure keeps your investment closer to your actual load-growth curve.

Better System Operation

A well-planned system, one which has *completely automatic, standard* unit substations, means fewer customer outages, better voltage conditions, and a lower equipment-failure rate. The dispersal provided by a number of smaller units (see diagram), compared with one large, central substation, localizes troubles and prevents huge equipment losses as well as large-area outages resulting from fires, explosions, or other misfortune.

Greater Flexibility

Shifting loads are easy to follow because these standardized units are relatively easy to move. *Increasing* loads are easy to handle by purchasing additional units as they are needed. This precludes the possibility of installing a large substation and waiting for a load which may never develop.

Lower Overhead

G-E *unit substations* are shipped directly to the installation site in completely assembled sections. You save the time and expense of passing hundreds of parts through stockroom or warehouse. You avoid the confusion of lost, delayed, or forgotten or duplicated parts, rush orders, and consequent rehandling. Installation is always much easier and faster than it is with a piecemeal-built substation, and there can be a more efficient use of man power. Crews quickly become familiar with them because there are only two or three pieces to handle.

Ask your G-E representative for Bulletin GEA-3800, or for a detailed presentation of our complete line in the light of your specific problem. General Electric Co., Schenectady 5, N. Y.

*G-E unit substations are now being built repetitively from standard components for almost any application you may have.

GENERAL ELECTRIC

302-21-5900

ELECTRA'S HUSBAND

Trends in Home Building

"MRS. SMITH and I were comparing plans for our postwar houses today," Electra said one evening recently. "We don't seem to think alike on a lot of things. She's going to put in a gas range and a gas water heater and she doesn't want a dishwasher. About the only thing we agree on is an automatic washer in the laundry."

"Well Mrs. Smith's house won't be modern and ours will," I said. "If I could have my way, we would put in a lot of gadgets like that fellow in southern California has in his home. Or didn't you read last week's *Life?*"

"Before we go in for gadgets, let's settle on the major things," Electra said. "Shall I tell Mrs. Smith her house won't be modern if she uses gas?"

"You might just as well," I answered. "One of the fellows has sent me some dope about the trend of new home building in his community just prior to the war. He dug the information up to get some idea of what might happen when new home building starts again. If the trend follows his findings, then both Mrs. Smith and the gas people are out of luck."

"What do you mean?" Electra said.

"It's this way," I answered. "My friend checked all of the new homes built in his community during the first six months of 1941. There were 1,389 of them and 85% had electric ranges installed. Only 10% had gas and the rest used wood or coal. But that's only half the story. A total of 1,225 of these new homes had electric refrigerators in them. There were only 28 gas refrigerators and 20 ice boxes; the rest didn't have anything."

"Gee, that's tough on the ice man," Electra interrupted.

"How about the gas man?" I asked. "But he got a better break on the water heaters. Only 47% of the homes had electric water heaters installed and 13% used gas. The rest had coils in the furnace or used oil. Figures like those ought to show Mrs. Smith which way the wind will blow after the war."

"But she won't be convinced that easily," Electra said. "She'll have to be sold."

So will a lot of folks, I thought, as we let the discussion drop.

ELECTRA is a great admirer of Eric Johnston, dynamic young Westerner who has made such an outstanding record as president of the U. S. Chamber of Commerce. She reads everything he writes. In fact she can't see why he doesn't run for office. The other day she gave me the following extract from one of his speeches with the suggestion that a whole lot of young folks should read it:

"We know that wherever government has entered into the domain of private enterprise, in so-called 'mixed' economies, it has come to dominate business. In any partnership between an all-powerful government and a business organization, large or small, the private side of the combination inevitably becomes the silent and helpless partner. By the same token, wherever government has entered into partnership in trade unions—as in Germany, for instance—it has meant that the trade unions were reduced to total impotence.

"Americans throughout their history have harbored a healthy distrust of 'big government.' That distrust remains our greatest defense against super-statism. I address myself especially to liberals and progressives in urging that this wholesome fear of too much government be kept alive. There never was a time in our career when it was more important to weigh every project for state control in the scales of personal liberty and personal initiative.

"Every time the state subsidizes an individual, the state by that act becomes more authoritative and the individual gives up some right. If that process were to be carried to its ultimate conclusion, then it would be only a matter of time until the state would be the master, not the servant; until the state had all the power and the individual had none; in short, until the state became total and absolute.

"What have been the sources of American greatness? One of them certainly has been the fact that America placed no ceilings on opportunity. Every bench mechanic has expected to become foreman, every section hand has looked forward to becoming railroad boss, every little business man has labored to enlarge his business. In other countries men and women have accepted fatalistically the station in the economic scheme to which they were born. In America the son who did not strive to surpass his father has been the exception rather than the rule.

"By all means let us provide safeguards against misuse of this American system. Let us bolster it with reasonable types of restraints to assure fair play for all. But let us achieve these things without damming the sources of our strength.

"The American wants the certainty of a job. But he also wants the right to change his job, the right to go into business, the right to expand his business. He knows that where there is only one employer—the state—he is doomed to subservience. He knows that where the state has the dominating role in economic life, with the incalculable powers that this implies, democratic controls, including elections, tend to become a mere formality without real relevance.

"I am convinced that the American men and boys and women who are risking their lives on the battlefields all over the world do not expect to be wrapped in cotton wool and spoon-fed by a patronizing government when they return. They expect a guarantee of opportunity—because in opportunity they see the only real security and the only real freedom.

"Super-statism is not a bogey of business men's imagination. It is the monster which has catapulted the world into war and threatens to expunge civilization. Unless we recognize it as a real danger, we shall lose out by default. Our opposition to it must be active, not passive."

SOME OF US were scanning the advertisements in the latest issue of *Electrical Merchandising*. The names new to the industry were legion. So were the promises of new products. Then one of the group called to mind a forgotten fact:

"Beginning just before the turn of the century there have been 1,041 makes of automobiles in the history of the industry. How many can any of you recall? On Pearl Harbor day there were 19 makes produced by nine manufacturers. Remember?"

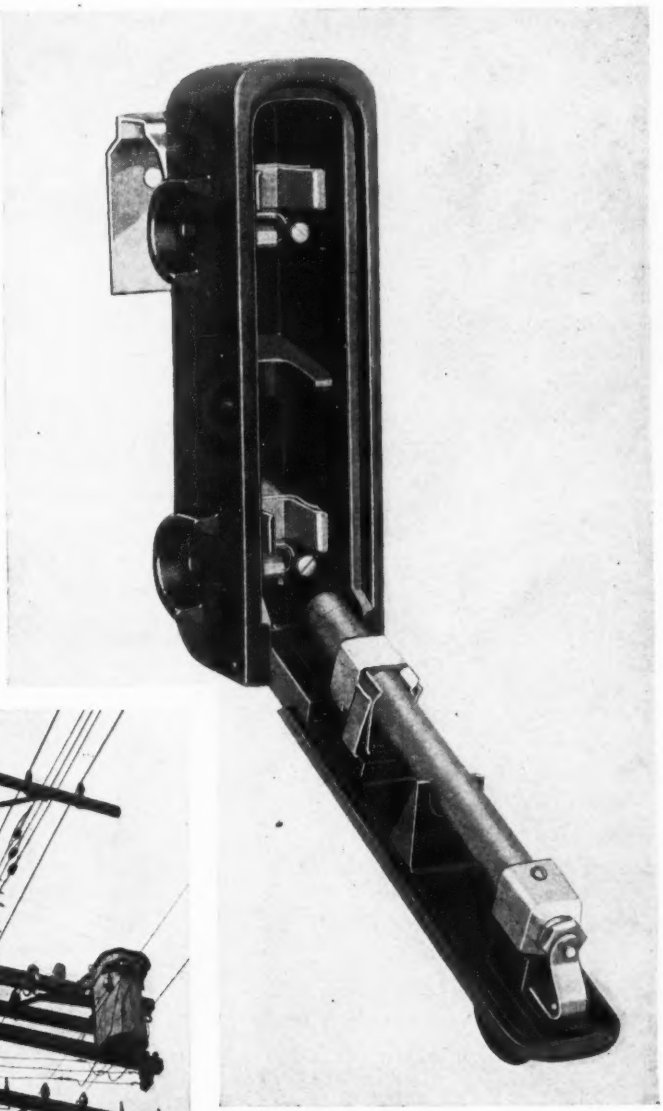
A lot of orphans were left behind in the development of the automobile. Will the appliance field be similar?

CONSERVE VITAL MATERIALS WITH

NON-INDICATING, PORCELAIN-HOUSED MATTHEWS CUTOUTS

RATINGS
50 and 100 Amperes
5 and 7½/12½ Kv Grd. Y

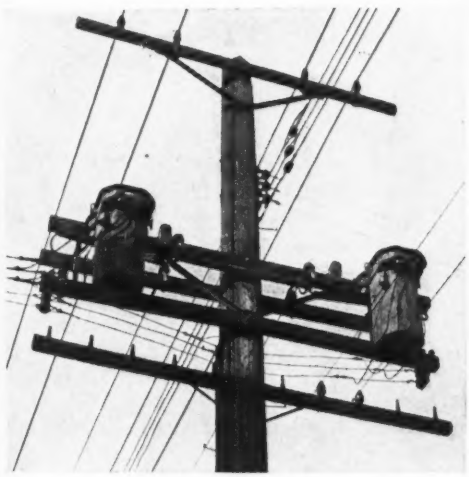
INTERRUPTING CAPACITIES
1200 and 3000 Amperes



Catalogs 950 and 956
(Interior detail same in all sizes)

Catalog 650

Catalog 850



Shows two single phase 4400 volt installations of Catalog 650 Matthews Cutouts.

Simple, sturdy design conserves vital war materials and man power by eliminating moving parts but without sacrificing electrical and mechanical efficiency.

For complete details
Write for Bulletin 103

WHY THEY ARE LIKED

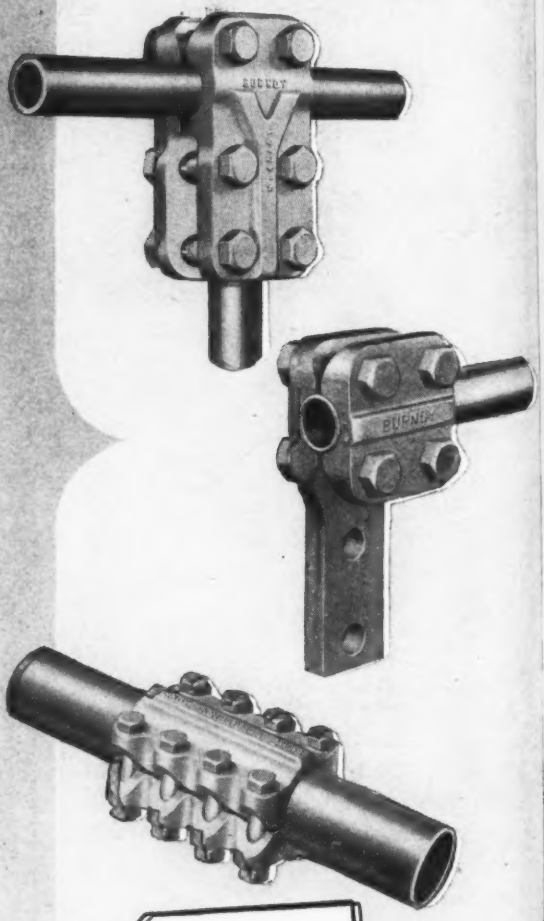
Simple —Rugged — No Moving Parts — Heavy Everdur Set Screws — All Current Carrying Parts Over 85% Copper Content —Time-seasoned Bakelite Covered Fibre Fuseholder Tubes Which Won't Warp — High Flashover Values — High Interrupting Capacity — Lowest Time-cost — Over 400,000 In Use. No essential changes in design in over fifteen years, but many refinements have been made. Price is lower than for indicating type.

W. N. MATTHEWS CORPORATION

SAINT LOUIS, U. S. A.

ENGINEERS and MANUFACTURERS SINCE 1899

NEW - a complete line of ALUMINUM POWER CONNECTORS



made of an heat-treated aluminum alloy, high in tensile-strength, elongation, conductivity!

Keeping constantly abreast of utility connecting requirements, Burndy now supplies aluminum connectors for connecting aluminum conductors, or aluminum to copper .. *in sizes and types for all power needs.*

This new Burndy line is made of a specially selected heat-treated aluminum alloy which combines *high tensile strength, high conductivity,* and *high elongation.* This latter property overcomes embrittlement; permitting the connector to conform tightly to the conductor without danger of cracking.

The design of each connector, too, has been determined through long, rigorous testing in the thorough Burndy way ... to assure the proportioning essential for *enduring high joint pressure* in service.

If aluminum has a place in your future sub-station plans, let us consult with you regarding these new aluminum connectors. Communicate with the Burndy representative near you, or write to connector headquarters. Burndy Engineering Co., Inc., 107V Bruckner Blvd., New York 54, N. Y.

Headquarters for CONNECTORS

Burndy

ELECTRICAL WEST

JANUARY, 1945
VOL. 94 NO. 1

PORTLAND TRIES ELECTRIC HOUSE HEATING

A. C. McMicken
General Sales Manager
Portland General Electric Co.

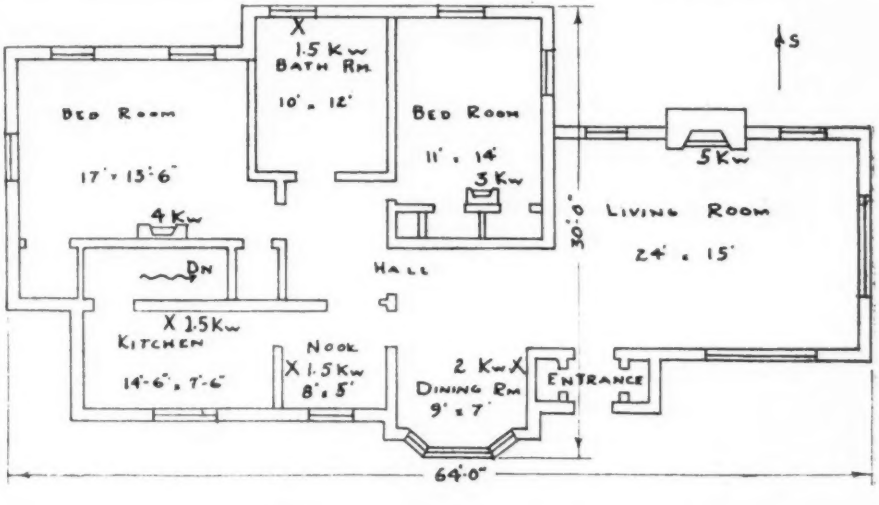
PRIOR to our entry into World War II, the development of the huge federal power projects at Bonneville and Grand Coulee and Portland General Electric Co.'s initial purchase of firm power from Bonneville prompted consideration of electric house heating as a possible additional use of electric service in the homes of its customers. Investigation revealed a dearth of reliable data applicable to house heating in the area served by this company.

Portland General Electric was one of the pioneers in promoting and developing greater use of electricity in the home. It was also one of the first utility companies to introduce and promote all manner of domestic labor-saving devices, from electric irons to electric ranges, and to introduce so-called promotional type rate schedules, and has always lent a sympathetic ear to suggestions for new and largely untried uses for electric service.

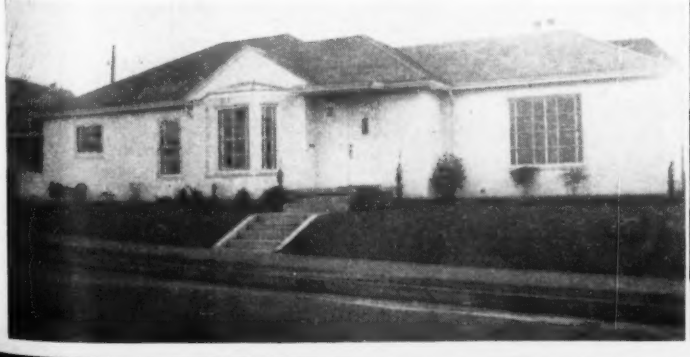
During 1939, anticipating general rate reductions and the early adoption of an all-service, single-meter residential rate schedule, which would eliminate separate metering of electric water heater service, and which would contain a 900-kwh. block at 7 mills per kilowatt-hour to encourage greater use of energy for water heating and a reasonable amount of space heating, the company encouraged a number of builders of new homes to heat them electrically.

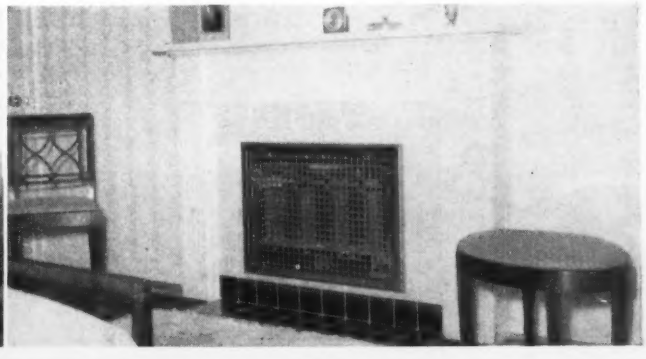
This was done primarily to get first-hand information on the highly controversial subject of electric house heating in that particular area. The belief was that if confined to four- and five-room houses, properly insulated and weather-stripped, heating costs under the new rate schedule would not be excessive. In addition to requiring insulation and weather-stripping, the utility specified that each space heater of 2,000-watt capacity and larger be thermostatically controlled to hold down the demand for service, to increase diversity factor and, insofar as possible, to prevent waste and customer complaints.

During 1940 and 1941, some thirty all-electric homes were built in the Portland area, all being electrically equipped for lighting, cooking, refrigeration, water heating and space heating. In almost every instance, basements were omitted, thus saving considerable investment in excavating, in concrete walls and floors and in oil



P. T. Boyd home (No. 9 in table on next page) with floor plan showing heater locations. House was rock wool insulated and weather-stripped for about $360





D. D. Regula home, No. 3 on table below, cedar wool insulated for $100

or other fuel fired central heating plants. The savings thus effected greatly exceeded the cost of insulating, weather-stripping, cost of heater circuits and electric space heaters.

Our entry into the World War and Production Board restrictions halted this program early in 1942, except for certain FHA approved apartment court structures consisting of four, four-room apartments in each structure, built by private builders to help relieve the local housing shortage. Structures of this type, containing in excess of 100 electrically equipped apartments, were constructed during 1943 and the first half of 1944, all properly insulated and fully equipped with electric ranges, refrigerators, thirty-gallon single-unit water heaters, and each apartment equipped with a 3-kw. space heater in the living-room, a 2-kw. space heater in the bedroom and in the combination kitchen-dinette, and a 1- or 1.5-kw. heater in the bathroom. The 2-kw. heaters in the bedroom and kitchen are on double throw switch so that both can not be operated at the same time.

While experience and data on apartment court structures is very limited, as the first of these, consisting of six structures containing 24 apartments, was first occupied in October 1943, the company has had three or more years in which to observe the all-electric operation of more than thirty private residences, ranging in size from four rooms, with a cubical content of 4,400 cu. ft., to seven rooms, with a cubical content of 16,000 cu. ft. That the heating service rendered and its cost to the users is entirely satisfactory is indicated by the fact that the company has yet to receive a single complaint. In fact, spot checks of occupants of both apartment courts and private homes reveal a high degree of satisfaction.

Table on p. 49 shows energy use by four apartments in one of the court structures shown in the accompanying photograph and is fairly typical of all 24 tenants in these structures. The individual maximum demands in these four apartment units occurred in January 1944, and were as follows:

	30 Min. Max. Demand	Time Max. Demand Occurred
Apartment 3506	4.73 kw.	9 p.m. on Jan. 27
Apartment 3508	7.38 kw.	3:30 a.m. on Jan. 28
Apartment 3510	6.13 kw.	7 p.m. on Jan. 28
Apartment 3512	9.76 kw.	11 a.m. on Jan. 29

The maximum demand for a similar group of apartment courts containing 28 apartments was 107.7 kw. and occurred at 10 a.m. on Jan. 22. This shows a diversified demand of less than 4 kw. per apartment. As these apartments are largely occupied by people employed in war industries, the variation in the time of demands may be due to different working hours.

It is appreciated that any data ob-

Analysis of Electric Heating for 20 Homes, Year 1943†

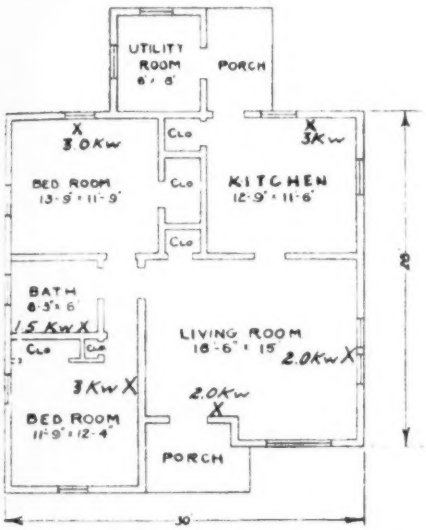
	Weather Strip	Insulation	No. of Rooms (1)	Cubic Feet (2)	Connected Heating Load; kw. (3)	Total Electric Service Kwh. (4)	Total Electric Service Billing (4)	Total Electric Service July-Aug.-Sept. Kwh. (5)	Total Electric Service July-Aug.-Sept. Billing (5)	Balance Chargeable To Electric Heat (Col. 4—4xCol. 5) Kwh. (6)	Balance Chargeable To Electric Heat (Col. 4—4xCol. 5) Billing (6)	Elec. Heat Kwh. per Cu. Ft. (7)	Avg. Annual Cost per Cu. Ft. (8)
1	D. & W.	W. & C.	5	6,900	14.0	17,998	$ 190.10	1,344	$ 20.05	12,622	$ 109.86	1.83	1.59c
2	D. & W.	W. & C.	5	7,920	14.5	13,190	143.37	1,232	19.27	8,262	66.29	1.04	.84c
3	D. & W.	W. & C.	6	8,216	16.5	17,620	183.34	Sub-meter on Heating		9,066	80.86	1.11	.98c
4	W.	W. & C.	3	5,000	9.2	11,740	132.38	1,730	22.76	4,820	41.34	.96	.83c
5		C.	3	4,900	9.0	13,788	148.78	1,202	19.07	8,980	72.50	1.83	1.48c
6	D. & W.	W. & C.	4	5,760	12.6	15,886	164.83	1,956	24.34	8,062	67.47	1.40	1.17c
7		W. & C.	4	5,700	11.0	17,520	180.91	2,158	25.76	8,888	77.87	1.56	1.36c
8	D. & W.	W. & C.	4	4,400	13.2	10,070	115.20	1,052	18.02	5,862	43.12	1.33	.98c
9	D. & W.	W. & C.	5	12,700	18.5	20,220	207.90	2,210	26.12	11,380	103.42	.90	.88c
10	D. & W.	W. & C.	5	6,800	14.5	10,000	115.40	1,200	19.05	5,200	39.20	.77	.58c
11	D. & W.	W. & C.	5	11,200	19.0	13,670	149.12	1,180	18.91	8,950	73.48	.80	.66c
12	D. & W.	W. & C.	5	6,540	10.2	12,242	135.08	1,966	24.41	4,378	37.44	.67	.57c
13	D. & W.	W. & C.	6	9,000	18.0	19,800	203.12	2,600	28.85	9,400	87.72	1.04	.97c
14	D. & W.	W. & C.	5	6,600	14.5	13,558	148.81	1,016	17.76	9,494	77.77	1.44	1.18c
15	D. & W.	W. & C.	5	4,740	8.0	13,234	143.77	1,236	19.30	8,290	66.57	1.75	1.40c
16	D. & W.	W. & C.	7	16,000	30.3	14,840	157.16	Sub-meter on Heating		8,262	68.51	.52	.43c
17	D. & W.	W. & C.	5	8,320	19.0	18,680	197.01	1,414	20.55	13,024	114.81	1.57	1.39c
18	D. & W.	W. & C.	8	11,230	32.0	24,250	247.95	2,530	28.36	14,130	134.51	1.26	1.29c
19	D. & W.	W. & C.	5	8,500	16.5	16,538	170.09	2,570	28.73	6,258	55.17	.73	.65c
20	D.	C.	6	9,000	17.5	18,614	193.96	1,940	24.24	10,854	97.00	1.21	1.08c
	Total			159,426	318.0	313,458	$3,328.28	30,536*	$405.56*	176,182	$1,514.91		c
	Average			7,971	15.9	15,673	$ 166.41	1,696*	$ 22.53*	8,809	$ 75.74	1.11	.95c

* Figures based on 18 of 20 homes.

† This table shows the total consumption for the year 1943 for twenty typical Portland all-electric homes. The use of energy for space heating was arrived at by assuming that the average use of energy for lighting, cooking, water heating and appliances during the months of July, August and September would also be the average for the other months and that the remaining kilowatt-hours were used by the space heaters. This actually gives space heating a little the worst of it, as winter lighting and possibly cooking usage would be somewhat greater than in the summer months.

Rate schedule: First 50 kwh. 3.5c; next 75, 2.5c; next 100, 1.5c; next 900, 7 mills; over 1125, 1c; minimum $.85.

tained from the small number of electrically heated houses and apartments now served will not be conclusive and will not fully answer the questions in the minds of many as to the desirability of such load. Nor will it tell whether or not it can be served profitably at compensatory rates and at the same time be competitive with other methods of house heating. It is very apparent however, that when postwar building resumes in this electrically minded area, many home owners will demand electric heat and will be willing to pay a reasonable premium to enjoy its convenience and comfort. Perhaps electric house heating is now in the stage of development that electric ranges and water heaters were at



Another typical small home, No. 10 in table. Heaters and wiring $345

the inception of these appliances, when many utility operators were sure that such loads could not be served profitably.

With the limited data so far accumulated, it is not possible to determine the desirability of a large volume of house heating load, but it is apparent that a considerable number of electrically heated small homes can be served without materially increasing investment in distribution system. Assuming that in this area, ample power will be available from present and projected federal hydro developments, thus eliminating further power plant investment on the part of utilities, the problem is largely one of distribution investment and cost of power.

Promised postwar marked improvement in efficiencies of other types of house heating equipment and the advent of climatized homes will offer serious competition to all-electric house heating as we now know it. It is appreciated that there are loads more desirable, because of the poor annual load factor and possibly high demand factor of electric house heating, but we believe it will be possible in some measure to offset this condition by promoting and encouraging increased uses of energy in those seasons of the year when house heating is practically non-existent; and we feel that until we have a great deal more load of this type than we have at present and much more reliable information, we should remember that we are in the business of supplying electric service and should endeavor to meet all demands, if we are to function as an electric utility.

Our limited experience with the present type of individual room heaters, each thermostatically controlled, indicates that there may be a greater diversity factor in heating load than has been anticipated, particularly when space heating is used in connection with electric cooking, water heating and many other domestic applications which will be introduced as soon as hostilities cease.

Experiments in electric house heating in the Pacific Northwest are nothing new, as the City of Tacoma encouraged electric house heating as early as 1914, with results not entirely satisfactory either to the utility or to customers. These early experiments are not conclusive, however, as great strides have since been made in the art of distributing electrical energy, in the types and efficiencies of electric space heaters and in the construction and insulation of small homes.

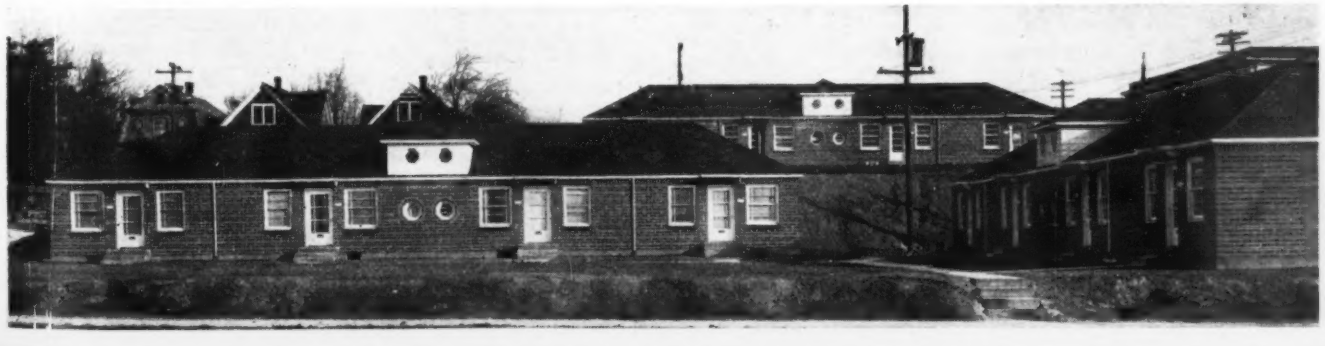
If, in the postwar era, electric energy for househeating in the Pacific Northwest can be purchased from federal power developments on a basis which will permit its profitable resale for this comparatively low load factor seasonal business, one of the major problems confronting electric house heating will be solved.

All-Electric Apartment Court†

	—No. 3506—		—No. 3508—		—No. 3510—		—No. 3512—	
	Kwh.	Amount	Kwh.	Amount	Kwh.	Amount	Kwh.	Amount.
1943—								
November	1,556	$15.73	918	$9.98	1,034	$10.79	1,210	$12.27
December	1,302	13.19	1,370	13.87	1,074	11.07	1,288	13.05
1944—								
January	1,380	13.97	1,550	15.67	1,094	11.21	1,376	13.93
February	1,172	11.89	1,450	14.67	1,314	13.31	1,348	13.65
March	1,364	13.81	1,216	12.33	1,068	11.03	1,098	11.24
April	750	8.80	942	10.14	750	8.80	788*	9.07
May	642	8.04	668	8.23	434	6.59	508	7.11
June	552	7.41	484	6.94	318	5.78	378	6.20
July	322	5.80	332	5.87	148	3.97	262	5.38
August	284	5.54	242	5.24	244	5.26	248	5.29
September	340	5.93	424	6.52	286	5.55	130	3.70
October	466	6.81	454*	6.73	440	6.63	406	6.39
Total	10,130	$116.92	10,050	$116.19	8,204	$99.99	9,040	$107.28
Non-heating	3,784	69.08	3,992	70.52	2,712	59.12	2,560	57.48
Heating	6,346	47.84	6,058	45.67	5,492	40.87	6,480	49.80

* Change of tenants.

† Each apartment has living-room, kitchen-dinette, bedroom and bath, about 3,400 cubic feet.



Three of six 4-apartment structures; data for four apartments in the table

Turbine and Insulating Oil Developments

By use of inhibitors, new turbine oils have been developed having an expected life of from ten to twenty years. Research may likewise improve transformer oils. Rust prevention and inhibitors also discussed

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San Francisco

THE development within recent years of larger and more efficient turbines operating at higher temperatures, greater speeds and higher steam pressures has made improvements in turbine oils necessary. Likewise, improvements in transformer oils have been made necessary by increased use of electrical power and changes in design of electrical equipment. To achieve these improvements, the base mineral oils have been changed and additives have been used to obtain special characteristics. In this presentation the chemical raw materials with which the refiner starts will be described first, then the effect of refining processes on these substances will be taken up and finally the steps taken to convert the best base mineral oils into the present oxidation resistant and rust preventing products will be discussed.

As is usual for most oil products, transformer and turbine oils have several functions to perform. Transformer oil, as the name implies, provides primarily insulation in transformers, oil circuit breakers, and like apparatus. It also acts as a cooling medium to dissipate heat. In order to operate satisfactorily without much attention under all conditions over long periods, a transformer oil must have the following properties:

1. Stability to oxygen.
2. Low electrical conductivity
3. Low pour and cloud points
4. Relatively flat viscosity-temperature slope.

Turbine oils also have several functions to perform. Primarily, a turbine oil is a lubricating oil for the ring bearings, reduction gears, and auxiliary equipment of a turbine. As a lubricating oil, probably viscosity is the most important property and the proper viscosity must be used for each type of installation to obtain optimum operation of the equipment. Viscosity requirements are defined by equipment manufacturers and are dependent upon operating temperatures, speeds and pressures. The turbine oil must act as a coolant in an oil-circulating system and as a transfer medium to actuate the governing mechanism. In addition to these services, a turbine oil may be called upon to act as a lubricant for an internal combustion engine, on occasion. In order to perform these multifarious functions satisfactorily over a long time, a turbine oil should have the following properties:

1. Ability to resist oxidation
2. Ability to separate rapidly from water
3. Ability to prevent rusting of areas normally coated with oil
4. Non-corrosiveness to bearing materials
5. Little tendency to foam

Raw Materials

The raw materials used for the manufacture of insulating and turbine oils are complex mixtures of several types of hydrocarbons, contaminated with oxygen and sulfur containing compounds. Most hydrocarbons in the raw stocks belong to the type called "naphthene," which term covers several series of substances containing one, two, three or more saturated rings or nuclei, to which are attached one or more paraffin or alkyl side chains. These hydrocarbons are relatively stable substances. Two other types of hydrocarbons are present in the raw distillates, "aromatics" and "paraffins." The aromatics, as a class, are relatively reactive substances, some of which will oxidize to produce substances that condense to make sludges. Many aromatics are removed by the refining processes, and some finished transformer and turbine oils contain no aromatics. However, some aromatics are stable to oxidation and entirely suitable for lubrication. The paraffin hydrocarbons of the size existing in this boiling range are not suitable components of transformer and turbine oils, not because of lack of ability to meet the majority of the previously mentioned requirements, but because they are solids at ordinary temperatures. They are removed by the dewaxing process if present in an amount sufficient to cause cloudiness in the oil above certain specified temperatures. So, the finished oils consist essentially of naphthene hydrocarbons.

The oxygen containing compounds are mostly acids of the type called "naphthenic." These materials are not desirable as they attack metals, form oxidation catalysts and assist in emulsifying oil and water. Therefore, they are removed completely even from moderately refined oils. Some of the sulfur compounds, of which relatively little is really known, are deleterious with respect to sludge formation, whereas, others are known to be beneficial in preventing rapid oxidation of certain hydrocarbons. Starting with this complex mixture of hydrocarbons and non-hydrocarbons, the refiner has the problem of producing therefrom oils meeting the ever more exacting requirements of the manufacturers and operators of electrical equipment and turbines.

Insulating Oils

Transformer oils are usually made from non-waxy crudes because of the low pour requirement. Other crudes could be used, but dewaxing to make —50°F. pour point is not yet practical. Of course, oils used only in the San Francisco Bay area would not require a lower pour point than +20°F., but when the oil leaves the refinery it may go to the Sierras, Montana, or Alaska where —50°F. temperatures are likely. The raw distillate of approximately 50 to 60 SSU at 100°F. and boiling in the range 500°F. to 700°F., is treated with acid or solvent and acid, using sludging tendency as a control test. The amount of treatment required will depend on the raw stock being treated. In some cases it may be necessary to redistill the treated oil to remove the acid reaction products or to treat with an active clay to produce an oil meeting the oxidation requirements of the sludge test. At the same time, all polar compounds that might lower the breakdown voltage of the oil are removed.

A great deal of the work on the improvement of insulating oils has been due to studies of their oxidation sta-

* Author's revision for publication in ELECTRICAL WEST of a paper entitled *Transformer and Turbine Oils*, presented before recent meetings of the Operating Economics Section, Pacific Coast Electrical Association, held in San Francisco and Los Angeles.

bility carried out by the manufacturers of electrical equipment. Tests for the evaluation of sludging tendency adopted by the ASTM are based on work done by Dr. Snyder and Dr. Clark among others. These tests measure the amount of sludge formed (material insoluble in light petroleum naphtha) after exposure of the oil to accelerated oxidizing conditions. Using sludging tendency as the criterion of quality, refiners have improved their insulating oils markedly in the last ten years. Many transformer oils that give excellent performance under usual service conditions are now available but improvements in oxidation stability can still be made.

Turbine Oils

Conventional turbine oils are manufactured from lubricating distillates ranging in viscosity from 150 SSU to 1,000 SSU at 100°F. by refining processes using sulfuric acid, solvents and clay. These processes remove the more reactive aromatic hydrocarbons, the acids and some of the sulfur compounds, producing oils of maximum stability consistent with the properties of the raw material. Sulfuric acid has the ability to react with, oxidize and dissolve aromatic hydrocarbons and some sulfur compounds. Subsequent neutralization with an alkali removes naphthenic acids and the sulfuric acid reaction products. Solvents like phenol, furfural, chlorex and nitrobenzene, can dissolve the same sort of compounds. Clay has the ability to remove soaps, color bodies and other contaminating materials remaining from previous refining operations, and to produce an oil that will not emulsify with water. So, using these processes, oils of fair stability are produced.

Properties of Turbine Oils

	Naphthenic Base			Paraffinic Base		
	Conventional		Highly Refined	Conventional		Highly Refined
Gravity, °API	25.9	23.2	29.4	30.6	28.6	30.2
Flash, °F.	335	385	340	395	450	450
Viscosity at 100° F., SSU	165	485	150	150	420	390
Viscosity Index	30	30	60	87	87	94
Pour Point, °F.	—35	—15	—30	5	5	+5
Neutralization No.	0.02	0.02	0.01	0.02	0.02	0.01
Steam Emulsion No.	70	130	60	80	140	90
Emulsion 130° F., NaOH, Min. to Settle	15	20	10	10	20	10
Rust Prevention	Fair	Fair	Poor	Poor	Poor	Poor
Oxidation Stability	Fair	Fair	Poor	Good	Good	Poor

The accompanying table shows the properties of four conventional turbine oils produced from two types of California crude. The first two oils were made from non-waxy crude by solvent, acid and clay treatment. They are oils of moderate refinement that have been used successfully in many turbines over long periods. The other two oils were made from waxy crude by processes of solvent treatment, dewaxing and clay treatment. The differences in gravity, flash point, viscosity index and pour point between the two types of oils, are due more to the crude than to treatment. These oils also have given excellent service in steam turbines and are superior in oxidation stability to the oils from the non-waxy crude.

The conventionally refined oils have their limitations. After treating to produce the optimum stability with respect to the hydrocarbons and inhibitors naturally present, the conventional turbine oils are still deficient in oxidation stability and rust preventing characteristics needed for operation of the newer turbines. Increased treatment is not the answer to this problem, as naturally occurring inhibitors of oxidation are removed and the resulting highly treated oils are more easily oxidized than those of lesser refinement. Also, the ability of the oils to prevent rusting decreases and corrosivity becomes worse with increased treatment. Further removal of natural oxidation inhibitors and other polar compounds makes the oil more deficient in these properties. The required characteristics of oxidation stability, rust prevention, and non-corrosiveness, have to be obtained by other means.

In the table the properties of two highly refined oils are compared with corresponding oils of moderate refinement. Increased treatment has increased the API gravity and the viscosity index, has decreased neutralization number and carbon residue and has improved emulsifying characteristics. However, to offset these minor advantages, the highly refined oils have poorer oxidation stability and permit rusting to occur more quickly than do the conventionally refined oils.

Two types of reaction are involved where oxidation of petroleum hydrocarbons is concerned. They differ both in the kind of hydrocarbons taking part, and in the type of end-products. When some aromatic-naphthene hydrocarbons oxidize, intermediate products are formed that condense and polymerize to produce carbonaceous materials insoluble in oil, like gums, lacquers and sludge. Such reactions occur with the conventional oils, although many hydrocarbons that oxidize in this way are removed even by the conventional refining processes. The reactions involved may be depicted in pseudo-chemical language by the following equations:

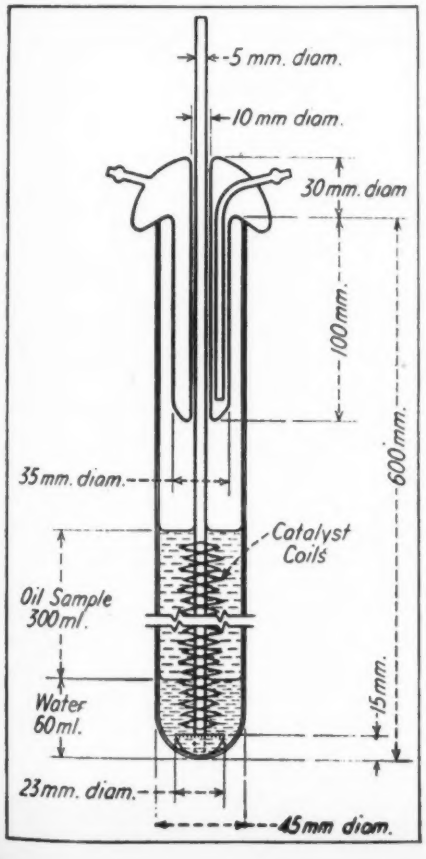
1. Hydrocarbon (A) + oxygen (xO) $\xrightarrow[\text{(oxidation)}]{\text{reacts slowly}}$ to form oxidized hydrocarbon (AOx).

2. Oxidized hydrocarbon (nAOx) reacts to form $\xrightarrow[\text{(condensation)}]{}$ a carbonaceous material ($AOx \cdot AOx \cdot AOx \cdots\cdots$) in a long chain reaction.

This type of oxidation is difficult to inhibit, probably because the initial oxidation reaction is slow and direct.

The other type of oxidation is the one by which the paraffins and naphthenes react. This reaction follows a chain process in which oxidation takes place through the medium of an activated oxygenated molecule, rather than

Fig. 1. Oxidation cell for ASTM turbine oil test. This method of evaluating the stability of turbine oils consists of agitating the oil and water in the presence of copper and iron catalysts



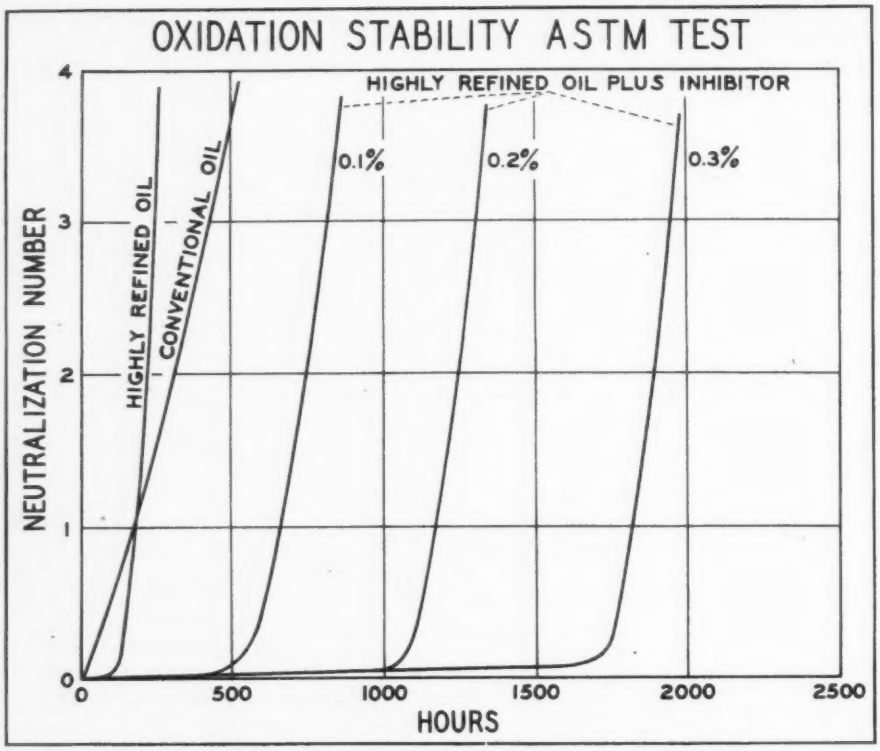
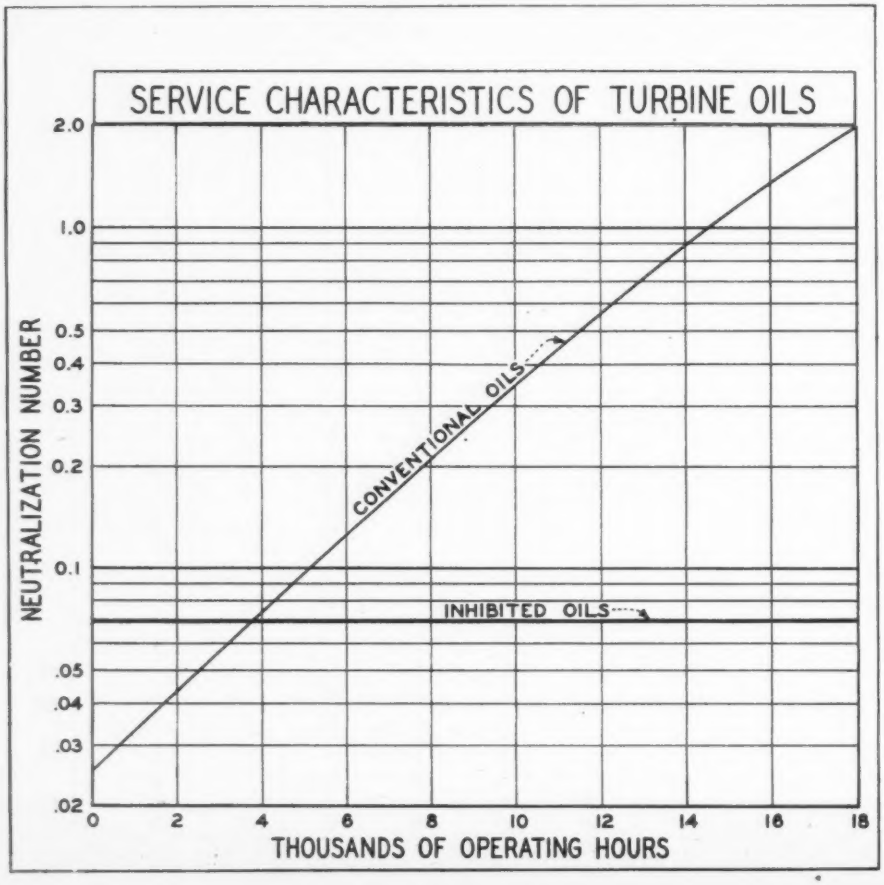


Fig. 2. Results of oxidation tests on several oils showing neutralization number versus time. The ASTM considers life of 1,000 hours in oxidation test satisfactory. During inhibition period oil does not change important properties

Fig. 3. Change in neutralization number of conventionally refined turbine oil is plotted against service life. Chart also shows values for inhibited highly refined oils. No change in neutralization number occurred in 18,000 hours



through direct action of oxygen on the hydrocarbon. Oxygen transfers from the activated molecule to the hydrocarbon and an active radical is formed again that can be easily oxidized and so continue the chain. These reactions may take place as follows:

1. Hydrocarbon (B) becomes activated (B*).
2. Activated hydrocarbon (B*) + oxygen (O) $\xrightarrow[\text{(oxidation)}]{\text{reacts to form}}$ oxidized activated hydrocarbon (B*O).
3. Oxidized activated hydrocarbon (B*O) + hydrocarbon (B) reacts in a fast reaction to form oxidized hydrocarbon (B*).
4. Oxidized hydrocarbon (B*) + oxygen (O) reacts to form oxidized activated hydrocarbon (B*O).

The final product of this type of reaction is not a carbonaceous sludge as in the first type, but may be an oil-soluble acid or other oxygen containing product. On contact with water these materials may form emulsions equally detrimental in a turbine. The secret of stopping this kind of oxidation is to add a substance that will react rapidly with the original oxidized activated molecule and destroy its activity, thus breaking the chain. The action of an inhibitor may be shown as follows:

Oxidized activated hydrocarbon (B*O) + inhibitor (X) reacts in a very fast reaction to form oxidized inhibitor (XO) + deactivated hydrocarbon (B).

Inhibitor Developments

Many materials have been developed that will perform this job. However, the development of an inhibitor for a turbine oil or transformer oil required extensive study, because so many other requirements had to be met, chief among these being lack of effect on emulsifying properties. The problem has been solved, however, with the result that highly refined base mineral oils, unstable by themselves, are now being inhibited to make turbine oils that will outlast older turbine oils many times, and at the same time lubricate all parts of a turbine satisfactorily.

Of course, commercial installations cannot be used to test experimental oils for oxidation stability. Test methods had to be developed for both research and control purposes. Many test methods have been used for evaluating oils for oxidation stability. The method adopted tentatively by ASTM consists of agitating the oil and water with air

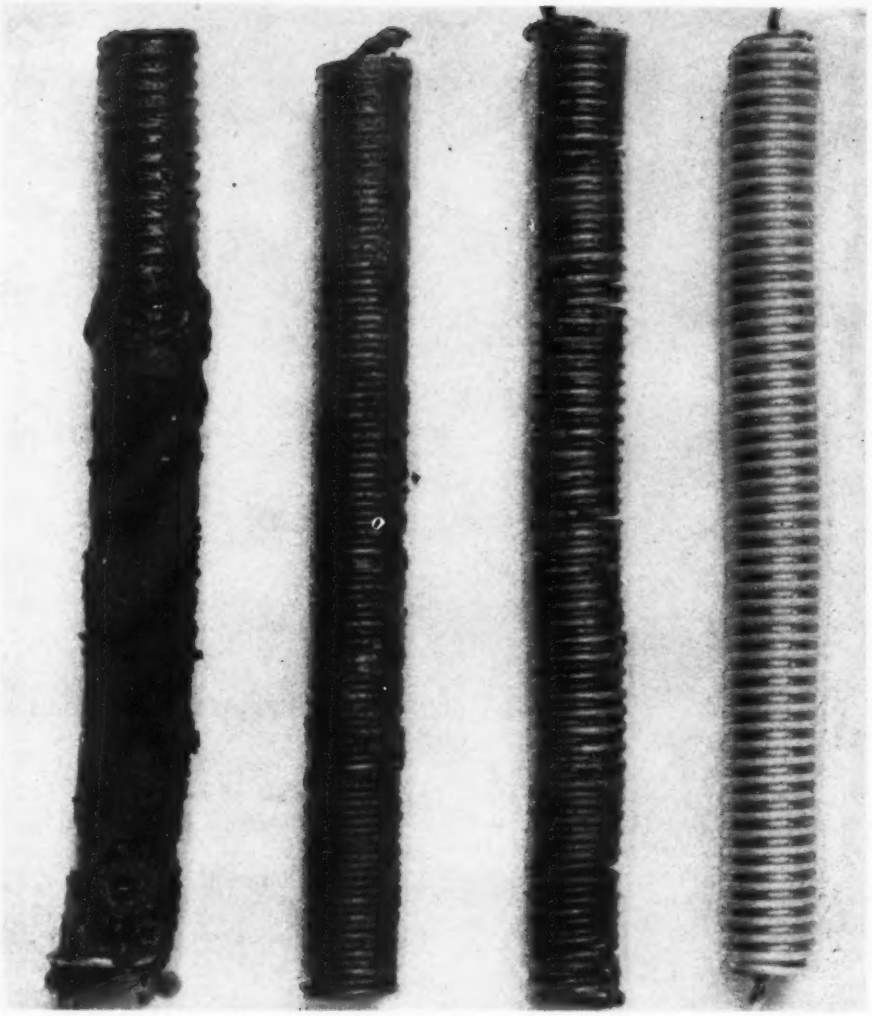
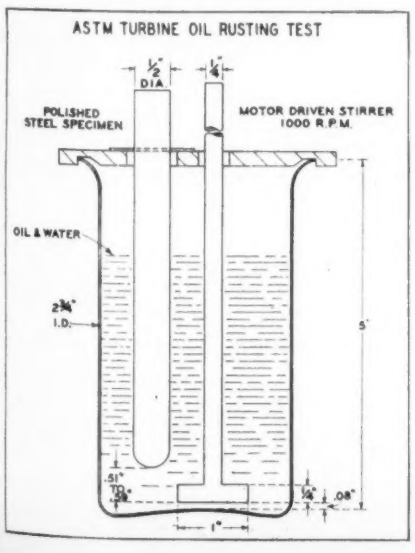


Fig. 4. Oxidation deposits on catalyst are here shown. On left is a straight mineral oil after 120 hours. The two in the center are of oxidation inhibited oils with inadequate rust inhibitor after 1,000 hours. The catalyst on the right is for an oxidation and rust inhibited oil after 10,000 hours plus

at 205°F. in the presence of copper and iron catalysts. The operating details were the result of cooperative investigations by a number of oil and electrical equipment laboratories. The test is run until the neutralization number of the oil has reached a value of 2.0 mg. of KOH per gram of oil. The details of the apparatus are given in Fig. 1. A large amount of experimental work was required to determine the optimum air rate, size of catalyst and position of catalyst with respect to oil-water ratio to obtain reproducible and repeatable results. Using this apparatus, marked differences between the older oils and the new inhibited highly refined oils can be obtained.

Conventional oils may last 100 to 200 hours in this test, whereas properly inhibited oils may last for 2,000 hours. The ASTM considers a life of 1,000 hours in the turbine oil oxidation test satisfactory. The results of such tests on several oils are given in Fig. 2. Here are shown plots of neutralized number versus time for several oils. The older type turbine oil shows a gradual increase in neutralization number with time. Such oxidation is accompanied usually by formation of carbonaceous sludge, the amount of oxygen reacted being much greater than that corresponding to the acid formed. The curve for the base oil used for the new inhibited oils differs in shape from that for the conventional oil. This highly refined oil does not show any evidence of oxidation for 100 hours and then oxidizes rapidly. The inhibited oils behave similarly except that they remain unreacted for many more hours, depending on the amount of inhibitor added, and then oxidize like the original oil. During this "inhibition period" the oil does not change in viscosity, demulsibility, surface tension and other properties.

Fig. 5. Rust test apparatus tentatively adopted by the ASTM comprises suspending a polished cold-rolled steel strip or rod in a well agitated mixture of oil and water for 48 hours at 140° F



Many older oils have given satisfactory service for thousands of hours before a neutralization number of 2.0 mg., the usual criterion for change, has been reached. The ratio of service life to time in the accelerated ASTM test may reach as high as 200 to 1, that is to say, 20,000 hours of service to 100 hours in the oxidation test. Even if a ratio of 100 to 1 is obtained for the new inhibited oils, a service life of 100,000 to 200,000 hours (10 to 20 years) may be expected. During this time the turbine system will be free from all carbonaceous sludge, as the new oil will not oxidize appreciably until near the end of its service.

In Fig. 3 the change in neutralization number of a conventionally refined turbine oil is plotted against service life. The oil gradually changed in acidity until after 18,000 hours it had a neutralization number of 2 mg. and was reclaimed. On the same chart are plotted values for inhibited highly refined oils. No change in neutralization number occurred in 18,000 hours.

Similar improvements in insulating oils may be obtained. By adding the proper oxidation inhibitors to the present insulating oils or to more highly refined oils, improved stability is possible. The evaluation of this improvement in terms of sludging tendency is difficult and tests must still be developed that will correlate with service before inhibited insulating oils become as generally used as inhibited turbine oils.

There are several classes of substances that will act as inhibitors of oxidation, some individual members of each class being much more effective than other members. Some amines, particularly certain aromatic compounds like phenylene diamine, are effective oxidation inhibitors. Phenolic compounds like alphanaphthol

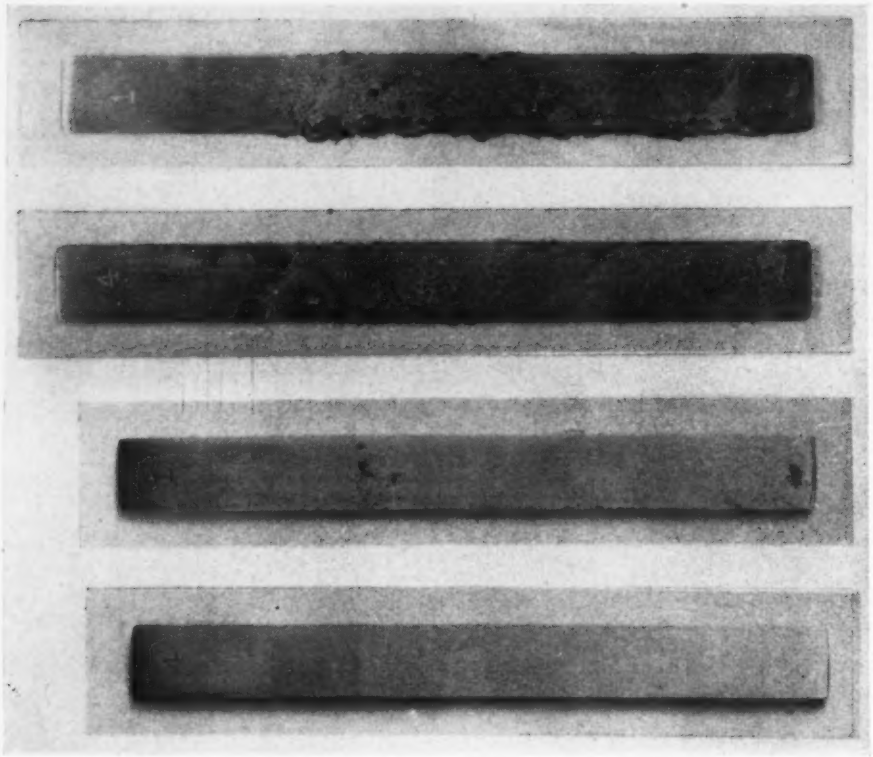


Fig. 6. Results of rust tests on four oils: 1, conventional oil; 2, oxidation inhibited, but no rust preventative; 3, same but insufficient rust preventative, and 4, an oil passing both the ASTM oxidation and rust tests

and pyrogallol are also effective. Compounds containing both amine and hydroxyl groups, like para-amino phenol, are very effective inhibitors. Some of the best inhibitors have undesirable properties such as insolubility in oil, tendency to change in color, high volatility and solubility in water that make them unsuitable for use in turbine oils. The inhibitors used commercially are mostly of the phenolic type.

The results of oxidation are further emphasized by the deposits on the catalysts. The photograph in Fig. 4 shows the deposits for several oils. One was an uncompounded oil that lasted only 120 hours before the neutralization number had risen above 2.0 mg. The others are inhibited oils, all of which lasted for 1,000 hours. The uncompounded oil oxidized badly and much carbonaceous material deposited on the catalyst. This material was mixed with rust. Two of the inhibited oils permitted rusting of the iron wire catalyst, there being no carbonaceous deposit. Although this test is not concerned with the rust preventing characteristics of turbine oil, it does give some indication of this property. The prevention of rusting is a problem quite separate from the prevention of oxidation of the oil.

Rusting is a reaction that requires the simultaneous presence of oxygen and water on the iron surface. Properly refined oils of themselves will not cause rusting. Lubricating oil distillates often are effective rust preventors, and conventionally refined oils often have some rust preventing properties. But for insurance against rusting an additive is needed. Much work has been done on this subject and a number of materials have been found that reduce rusting to a marked degree. To be satisfactory for turbine oil use, the rust preventive has to meet rather stringent requirements. Among others, it must not affect the oxidation stability of the oil, it must not change its emulsifying characteristics, and it must not be removed by water washing. Several turbine oils containing rust preventives have been produced meeting these requirements.

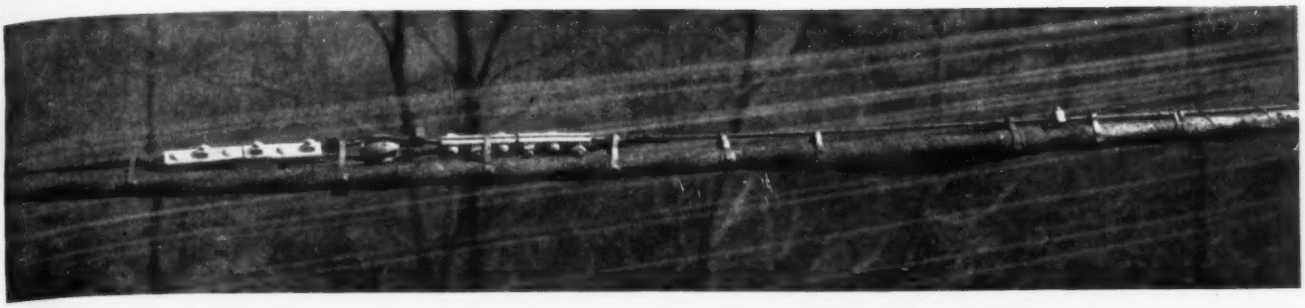
Although a great amount of work has been done on rust preventives throughout the country, little work of a fundamental nature has been published. It is generally believed that rusting is prevented by the inhibitor bonding itself to the metal in such a way as to prevent water and oxygen from reaching the metal. The strength of a rust preventive is a function of the tightness of the bond. For this reason acids and other polar molecules are the best rust preventives and commercial materials contain acids, or are highly polar in some other way. Some of the best rust preventives are the higher molecular weight fatty acids, like stearic and oleic, but these materials have disadvantages. The inhibitors used in turbine oils are acidic but their formulas are still secret.

The rust preventing properties of an oil may be measured in several ways. The rusting test used on turbine oils is based on a procedure developed by chemists of the General Electric Co. This test, now adopted tentatively by the ASTM, comprises suspending a polished cold-rolled steel strip or rod in a well agitated mixture of oil and water for 48 hours at 140°F. If the metal is not rusted in this time, the oil is considered to be satisfactory. Great care must be taken in running the test, particularly in handling the steel specimens, to obtain consistent results. In Fig. 5 a sketch of the apparatus is shown. The oil, 300 ml., and water, 30 ml., are stirred at a rate of 1,000 r.p.m. in the present modification of the test, and round rods are used instead of flat strips. The photographs in Fig. 6 show the results obtained with four oils:

1. A conventionally refined oil.
2. An oil containing an oxidation inhibitor capable of passing the ASTM oxidation test but lacking a rust preventive.
3. An oil containing an oxidation inhibitor and an insufficient rust preventive.
4. An oil passing both the ASTM oxidation stability and the ASTM rusting tests.

How well the rust preventive stops the action of air and water on steel is well depicted by this photograph. As rust in a turbine system is a hazard, particularly when it interferes with the governing mechanism, there appears to be a need for a rust preventive. However, turbine oils, during use, develop inhibitors that prevent rusting, so that the need for a rust preventive is a moot question. When new turbines are being started on new oil a rust inhibitor is really needed. It must be remembered, of course, that oils containing rust preventives can only prevent rusting of the steel surfaces with which they come in contact. The top surfaces of tanks, valve chambers, etc., that are not touched by the oil will still rust. These must be protected in some other way.

The new turbine oils inhibited against oxidation and rusting have been in use for only a relatively short time. Service data to date indicate that these new oils are living up to the expectations of their designers. Of course, they have been used only for part of their expected life, and the future alone can tell whether they will continue to be satisfactory. Meanwhile, research work on oxidation inhibitors and rust preventives, as well as on the base mineral oils, is continuing, and better oils probably will take the place of present inhibited oils in the future.



Aerial Cable Design—New Wire Coverings

Leadless, messenger type aerial cable solves tree problem. Present status of Buna S compounds and other wire coverings, new developments in oil static cables and lead sheath failures are discussed

INTERESTING new developments in the design of aerial cable to combat the tree problem on distribution circuits and latest information on the status of Buna S compounds and other synthetic wire coverings as well as new developments in oilostatic transmission systems and cable sheath failures were recently presented before regional meetings of the Operating Economics Section, Pacific Coast Electrical Assn., by I. W. Borda, Pacific Coast manager, The Okonite Co. Because of the wide interest in both subjects, the material is here presented in part.

It is very seldom that any manufacturer produces a cable which is completely new from start to finish. Actually, any new cable is the assembly of a lot of things which have become facts as a result of research and development and are based not alone on laboratory technique, but on experience in the field. One of the more recent developments in this category is a neoprene insulated, leadless cable with Copperweld supporting messenger for overhead installation which was designed as a solution to the tree problem on primary distribution circuits. Some of the accompanying photographs show such a cable being installed and two others give details of design and construction of two types of this cable.

The feature of this aerial cable is the fact that it has an in-built messenger of Copperweld or other steel which may be used as the ground. This aerial cable is particularly adaptable for installation where it is necessary to contend with heavy growth of a large number of trees where ordinary open wire construction would not have sufficient mechanical strength to withstand the weight of limbs falling on the lines during ice storms or high winds. Whereas the material costs for aerial cable are from 25% to 30% higher than for tree wire, the total installed costs of the aerial cable does not exceed the installed costs of tree wire by more than 12 to 20%.

Buna S

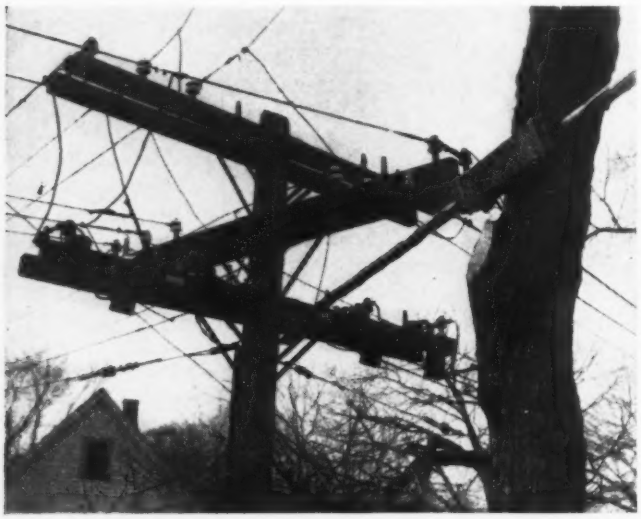
Information on the subject of Buna S was brought up to date with respect to its use as a substitute for natural rubber. In the early days, considerable trouble was experienced by the electrical industry due to lack of uniformity in the batches of Buna S as received from suppliers. Lack of uniformity in a raw material generally spells lack of electrical stability in the finished product. As a result of these troubles the electrical industry has prevailed upon WPB to allot for dielectric purposes only that Buna S which had shown the best qualities and highest uniformity and which came from two plants, one operated by the U. S. Rubber Co., at Naugautuk and the other by Firestone's St. Charles, La., plant.

One difficulty that was present in the early days was the inability to attain the physical characteristics that had prevailed when using natural rubber on the performance type comp onds and on the 60% sheaths of a mineral base. However, Buna S being a petroleum derivative, really came into its own when used in conjunction with an oil base compound. The

Above: Splice in aerial cable showing cable splice staggered with respect to splice in messenger. Shielding tape is bonded to messenger at splice and an effort made to keep conductors under messenger. Left: Tree conditions met

physical characteristics remained unchanged, but the electrical characteristics actually improved. So much so that one oil base compound now in general use has the ability to pass successfully and satisfactorily a corona test of 100 volts per mil, when bent in a "U" shape and resting on a metal plate.

Generally speaking, it has been possible to boost test voltages on oil base compounds by 25%, which is rather remarkable in view of the fact that test voltages were already high on such a compound. It has likewise been found advantageous to use a conducting tape next to the conductor when it is intended to operate at 2,000 volts or more. The use of this conducting tape provides a smooth surface next to the conductor, reduces the conductor stresses and eliminates the possibility of internal corona. The conducting tape results also in better all around dielectric tests.



Cable and messenger dead-ended at terminal point. Messenger wire was cut to extend 10 ft. beyond ends of cable during manufacture to make provision for dead-ending

Neoprene

It was pointed out that neoprene in any quantity is again available to the electrical industry, and that its high mechanical strength as a sheath on multi-conductors and particularly when applied directly over a dielectric without the use of a separator, is a very fine thing because it gives a reduced diameter as well as taking advantage of the material attributes of neoprene, such as resistance to oil, sun, moisture, abrasion and low corona.

Use of neoprene ink in color coding is a new development in connection with neoprene on single conductors. The ink being made of neoprene, becomes an intimate part of the cable and results in a permanent marking not rubbed off nor worn off. The coding can follow either that called for by NEMA for 21 conductors, or any other coding desired.

The splicing of thermoplastics in general is still a problem in that temperature control must be accurate. This is sometimes difficult in the field, particularly where low temperatures prevail.

Thermoplastics

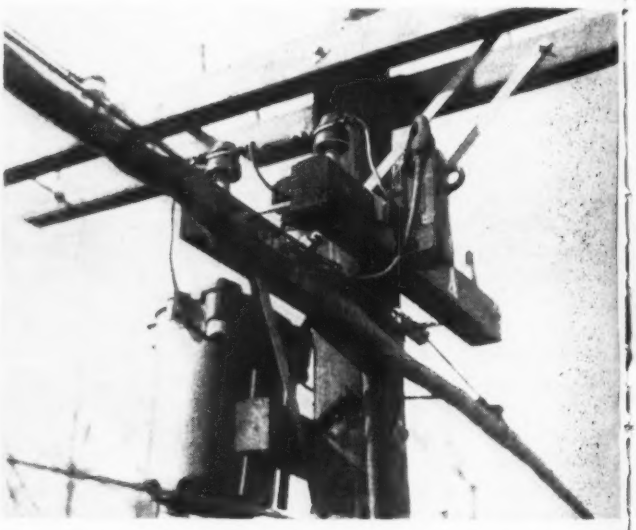
One of the new thermoplastics is polyethylene, which at present is restricted to war use. The only disadvantage of polyethylene is that, being a pure hydrocarbon, it will burn rather easily, but all of its other characteristics are definitely in its favor. Polyethylene comes from the source of supply in package form, much like dry cereal from a grocer and is easy of application to the conductor by the extrusion process.

Its power factor and dielectric constants are extremely low and it is admirably suited for high-frequency coaxial cables operating at 3,000 megacycles and over. It can successfully withstand a bend test at minus 40°C.; its dielectric strength is equal to that of paper, it will admit of a copper operating temperature of between 75 and 90°C., and it is absolutely impervious to moisture. Unlike most rubber compounds it is ideal for long-distance telephone transmission. Its present cost is quite high but the suppliers indicate that after the war its cost will be very low, in fact, considerably lower than the cost of rubber or neoprene. This, together with all of the things that it will do and the ease with which it may be applied will make it a very popular and useful dielectric.

Oilostatic Cable

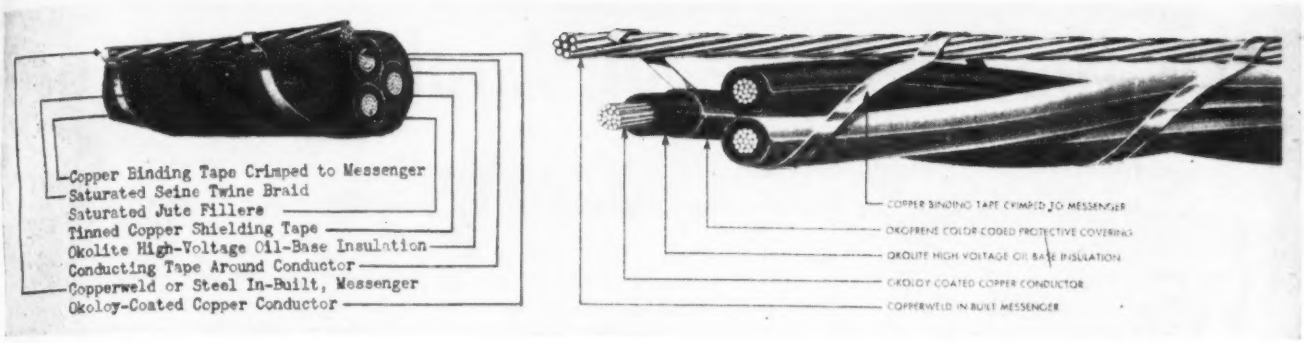
There have been three interesting new developments as applied to the oilostatic transmission system. This system can be furnished by any one of several manufacturers. One of the developments covers the theory of a dielectric failure, the answer to which is that in the opinion of conservative engineers, there will never be a dielectric failure on an oilostatic system. Such opinion is borne out by the fact that a 66-kv. cable was operated at 375-kv. for thousands of hours without the slightest deterioration of oil or paper, even after a deliberate fault was attempted by boring a hole through the paper clear to the copper conductor. No failure occurred, which is explained by the fact that the oil was driven in through the hole and maintained at a pressure of 200 lb. per sq. in.

Single-phase transformer taps were made by splicing tap onto one conductor of cable as shown. Being a grounded neutral circuit, messenger was tapped for the other leg



The second development is a method of locating a fault which takes advantage of the known fact that a considerable mechanical surge is built up in the case of a dielectric failure. By the application of diaphragms admitting passage of oil under normal operating pressures, yet which will blow when a surge occurs, a fault may be located by having a person read gauges on either side of the diaphragm to locate the section in which such a fault might lay.

The third new development is the use of Freon gas in conjunction with the oil, thereby eliminating completely any objection from a fire standpoint.


Copper Binding Tape Crimped to Messenger
Saturated Seine Twine Braid
Saturated Jute Fillers
Tinned Copper Shielding Tape
Okolite High-Voltage Oil-Base Insulation
Conducting Tape Around Conductor
Copperweld or Steel In-Built, Messenger
Okoloy-Coated Copper Conductor
COPPER BINDING TAPE CRIMPED TO MESSENGER
OKOPRENE COLOR-CODED PROTECTIVE COVERING
OKOLITE HIGH VOLTAGE OIL BASE INSULATION
OKOLOY COATED COPPER CONDUCTOR
COPPERWELD IN BUILT MESSENGER

Two types of new aerial cable showing details of construction Type of cable shown at right was used in the installation described. With running blocks and pull line the cable was pulled in 1,000 ft. lengths. Attachment for pulling was by means of a Kellems Grip, the end of the messenger being fed through the meshes of the grip so that the grip was around both the cable and messenger. The end of the messenger was doubled back and fastened to the pulling eye of the grip. Pull was thus divided between messenger and Kellems Grip by means of a ball-bearing swivel. Total labor to install the cable and make necessary splices and transformer taps was approximately seven man-hours per 100 ft. of cable Had cable been made in 1,200-ft. lengths, labor would have been approximately six man-hours

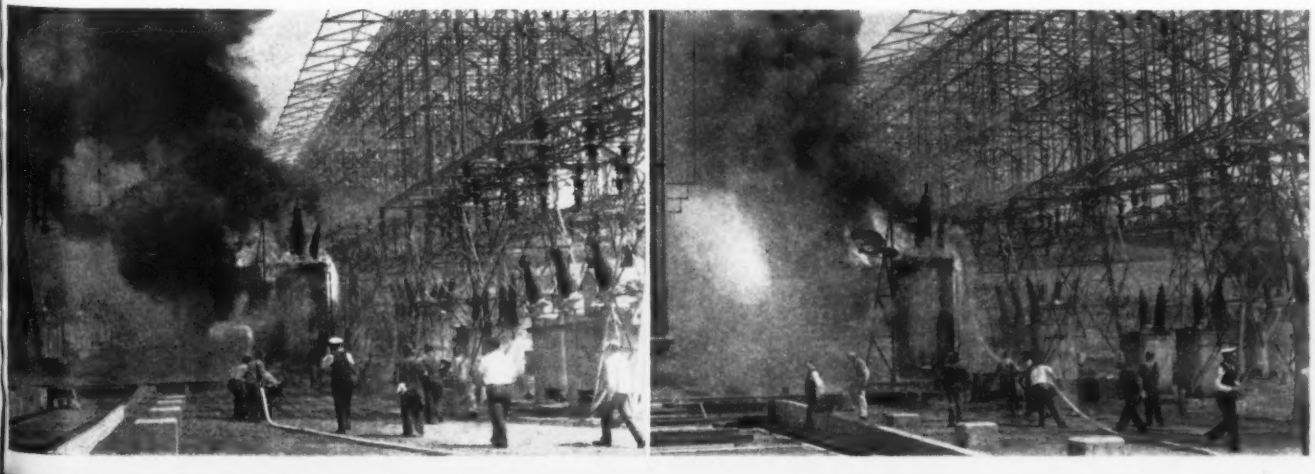
It is well known that oil which has been used for dielectric purposes will burn readily. Freon, being a gas at atmospheric pressure but a liquid under pressure, mixes readily and without any detrimental effects to the oil used as the dielectric. An experiment was cited where pure oil from a valve was deliberately set on fire and then promptly extinguished by the addition of more of the same oil to which there had been added 10% Freon. The action was similar to that of Fomex, which is a fire extinguishing fluid. The Freon, upon coming to atmospheric pressure, gassified and literally smothered out the already existing blaze.

Most lead sheath failures occur from stray currents, either anodic or cathodic; from dissimilar soil effects; from galvanic corrosion; from differential aeration and from chemical attack. The seriousness of such corrosion has been known and studied for a long time and many and various are the coverings which have been tried. Until fairly recently the wrapping of a duck tape saturated with asphaltic compound was considered quite successful, certainly better than applying extra heavy coatings of grease. However, the latest development is the construction of a cable where a thin layer of rubber compound is applied with the tape reinforcement directly over the lead. It is so applied as to provide a continuous seal with no fabric extending through this layer.

A comparison was made in the field of this latter method as opposed to the wrapping of duck tapes and after four years it was found that the resistance as measured between cable sheath and ground showed practically zero for the duck taping, whereas the resistance for the rubber tape method showed from 200 to 50 ohms.

A tribute was paid the cable industry as a whole with respect to the cooperation being afforded by all cable manufacturers with various departments of the government for the sole purpose and object of assisting in the winning of the war. This has meant the pooling of machinery and technical knowledge, as well as the scrapping of license agreements and the opening of trade secrets to all. When the full story may be told there will be every indication that the cable manufacturers have made a material contribution to the war effort.

Spectacular electrical fire pictures like those shown are rare because usually utility men are too busy in cases of trouble to take them. Leave it to a small town fire department though. Firemen shown are from the El Cerito, Calif., fire department, which makes a practice of taking record pictures of all fires. Shown by the photographs is an 8,333-kva., 165/95/12-kv. transformer on fire at station G of Pacific Gas and Electric Co. The fire started from an explosion inside the transformer caused by failure of a 15-kv. secondary bushing. Quick isolation of the fault prevented flashover on the 95-kv. bus from the dense smoke, and damage was confined almost entirely to the bushings



Take the Measure of Appliance Future

Meaningful testimony, applying everywhere, given San Diego dealers at the annual conference by factory men and distributors, points postwar trends

"WHILE we are not going to do any direct merchandising, we will undertake a postwar load-building program by means of manufacturers, jobbers and retailers. We are going to furnish every cooperative effort possible to make a successful operation out of the electrical industry in San Diego. In doing this this company is now completely revising its load-building organization."

With these words, A. E. Holloway, sales vice-president of the San Diego Gas & Electric Co., welcomed more than 225 members of the Bureau of Radio and Electrical Appliances of San Diego County to its annual fall meeting held in the service auditorium of the utility Tuesday evening, Nov. 28. Introducing Holloway was the bureau's newly elected president, William Powell.

Holloway warned that the retiring of the utility from the merchandising field would place even greater responsibilities upon electrical appliance dealers and distributors. "We have an important duty to see to it that the industry and business interests, homes, and individual citizens receive the best electric service that we are able to give. Good equipment must be sold and serviced by reliable firms who will see that each individual job is of the highest quality and standard possible. This obligation falls directly upon this bureau and its members. We can and must make San Diego one of the best electrified cities in the country. By doing this the utility, the manufacturer, the jobber, the dealer and the individual citizen will all benefit."

Wiring Advertising First

O. G. Thompson, San Diego manager for the General Electric Supply Co. and newly elected chairman of the bureau's advertising and sales promotion committee, announced that the 1945 advertising program for the bureau will emphasize better wiring in the homes. "This," he said, "will benefit us in the electrical appliance industry in two ways. First, it will mean we will have more satisfied customers, because appliances will have every chance to operate efficiently. Secondly, it will mean that there will be fewer appliances returned because house wiring is insufficient to carry the load. If we want more business in the postwar world, we've got to remember that we can't sell appliances to homes if they aren't wired to handle them." Forrest Raymond, advertising manager of the utility, displayed copies of the advertising material as a preview of the campaign.

J. Clark Chamberlain, secretary-manager of the bureau, briefly reviewed the WPB spot authorizations which have permitted limited production of vacuum cleaners, home freezers, electric ranges, water heaters and refrigeration display cases. Gas ranges with thermostatic controls are now beginning to arrive in San Diego, while electric irons are trickling in in small quantities.

Distributors Quizzed

Following this was an open round-table discussion in which several of the out-of-town distributors were given an opportunity to state their companies' positions in regard to the resumption of appliance manufacture. Glen Harker, Pacific Coast manager of the General Electric division of small appliances, said that his Ontario, Calif. plant would be halfway through its allotted production of 421,000 electric irons by Dec. 31. He said that WPB had approved material for the first quarter production in 1945, and that, by the end of the year, the Ontario plant's manufacture of electric irons should be almost back to normal.

"Chuck" Moore of the Chicago Flexible Shaft Co. warned that, although his company's production of electric irons is proceeding according to schedule and that limited supplies are now arriving in San Diego, a big job still lies ahead. "It will take 30 days after Eisenhower says he has enough material before Sunbeam can retool and 90 days before enough material can be gathered to resume production." Moore revealed that the recent WPB order No. L65A will make it possible for 4,500,000 electric irons to be manufactured in the United States next year—regardless of the progress of the German war.

Lou Willis, Pacific Coast factory manager for the Admiral Corp., said that his firm was turning out around $1,000,000 worth of radar equipment a week. "We are having a hard time finding enough radio tubes for this vital equipment, so I don't see how it will be possible for us to begin turning out civilian radios for some time yet." Willis introduced Herbert H. Horn, who will be the southern California distributor for Admiral. In turn, Horn introduced Ray Cox, who has just assumed the post of sales and promotional manager for the entire Herbert Horn organization. Cox comes from the Sunset Electric Co. of Seattle.

"Shorty" Sherman and Lou Swenson of the newly formed partnership of Sherman, Swenson and Associates will handle Farnsworth Television, Deepfreeze, Adel, Duo Therm and Electromaster lines after the war. John Gunderson of the Thor Pacific Co. announced that the new Thor automatic washing machine will be of the agitator type. "In fact," he said, "even our sales promotional material for it has been printed and is now in storage. Just when we will be able to use it will depend upon when we will be able to get materials to start production. And when we will be able to get materials is a matter that is entirely up to Germany!"

New Dishwasher

Victor Halperin of the Harvey Machine Co., Los Angeles, announced that his firm would enter the electrical appliance field for the first time after the war with the production of radios, dishwashers and automatic clothes dryers. Ben Roe, vice-president of the J. N. Ceazan Co., Crosley distributors, announced that the Crosley factory had any number of plans for production depending upon the course the war may take or upon the decision of the government. "For example, if we are allowed to make only two models of refrigerators, we know now exactly what two models they will be."

Other round-table speakers included Ed Barnes of the Nash Kelvinator Co., Steve Maher of the General Electric Distributing Co., Paul Buehler and L. E. Starkweather of the Leo J. Meyberg Co., Sam Scott of Graybar, Lowell Wood of the Lowell Wood Co., Frank D. Wallace of the Horton Co., A. C. Smith of the Easy Washer Co., and U. S. Grant of U. S. Grant Supply.

National publicity on the plan which the bureau formulated last spring to reduce dealer-distributor losses was

displayed by Frank Guasti, chairman of the bureau's postwar planning committee. In reviewing this plan to eliminate practices which often cost dealers and distributors untold losses prior to the war, Guasti urged every member present to give the plan careful study in order to avoid these business pitfalls in the future.

Growth of the consumer cooperatives in America and the danger they present to the electrical appliance retail business was outlined by Ash Chamberlain, manager of the San Diego Refrigeration Equipment Co., and also a member of the Guasti postwar committee. Chamberlain pointed to the growth of the oil co-ops in the country, showing how they have grown from a single service station to one of the nation's largest independent oil businesses in twenty years. "If this can happen in the oil industry it can also happen in the appliance industry. Growth of cooperatives will mean the death of not only many dealers, but wholesalers, and eventually manufacturers as well," he concluded.

Although dealers and distributors may not have anything on their shelves, they still have plenty to sell if they wish to remain in business after the war, warned Jim Carothers, sales manager for Hage's and past president of the Los Angeles Sales Managers' Assn. "Sell courtesy if your shelves are vacant, and you'll be making deposits in the bank after the war.

"The sales honeymoon is about over," he said, "and I can tell you that your customers are getting fed up on the brand of insolence they've had to put up with over these war years. We are going to have surpluses tomorrow and, if we're going to get rid of them, we'll have to sell and sell."

"Who Is Studying Now?"

Carothers warned dealers that they would have plenty of stiff competition from returned service men who financed by the government, are planning to go into business for themselves after the war. "I have seen these men taking vocational school courses on business, merchandising and salesmanship, two and three nights a week. How many of you are studying two or three nights a week about your business?

"You can't build up an effective sales organization in four months; you'll have to start now! Do your windows invite people into your store? Does your merchandise say, 'Take me home?' What are you doing about those lists you used to keep before the war—your telephone lists, your lists to whom you used to write letters regularly? San Diego has doubled its population since 1940; how many of these new folks have you made an effort to get acquainted with? It has been said that this war would never have happened, if we in the United States had done something about it soon enough! You can enjoy heavy postwar sales if you will organize your sales forces in time."

E. W. Meise, domestic sales engineer for the San Diego Gas & Electric Co., briefly outlined the activity of the newly organized Home Planners' Institute of which the bureau is cosponsor, along with every agency and trade association directly or indirectly interested in the building industry. The institute is offering a free course of twenty lectures covering all phases of new home building, he said. Out of these twenty, there are four classes of special interest to the electrical industry: Planning the kitchen, selection of appliances, house wiring, and heating and ventilating.

Concluding phase of the meeting was a brief talk by Hance H. Cleland, president of the San Diego Gas & Electric and 1945 PCEA president. Cleland reviewed the history of the postwar planning activities of the chamber and then introduced Frederick Sykes, secretary of San Diego's Chamber of Commerce Postwar Planning committee, who presented interesting figures on the growth and trends of San Diego's population.

● LISTENWALTER AND GOUGH, warehouse and display room opened a year ago at 3255 Fifth Ave., San Diego has listed the lines it will carry after the war. Although distributors for Philco radios and ABC washers in Los Angeles, Listenwalter and Gough's San Diego line will omit these items, since they are already carried by the Standard Electric Corp. However the firm will handle Sonora and Arvin radios, General Electric, Toastmaster, Universal, Proctor and Hamilton Beach electric table appliances, Schick shavers, American Beauty irons, Nutone chimes, Rival juicers, Thermador electric heaters, Hankscraft electric egg cookers and bottle washers, A. C. Gilbert vibrators and drink mixers, Seth Thomas and Westclox clocks, and the Knapp-Monarch line of small table appliances. Listenwalter and Gough will also carry the new line of Youngstown kitchen cabinets. Managing the new San Diego branch is George L. Porter. Assisting him will be Jack Gariepy.

● ONE of San Diego's former distributors, the San Diego Auto Electric Co., 916 Union St., will confine its electrical appliance activities entirely to retailing after the war, according to Elmer Hazie, manager. Heretofore the San Diego distributor for Crosley, San Diego Auto Electric will retail the Crosley line of refrigerators, washers, and radios in the postwar period. Other retail lines will include Kelvinator refrigerators, Thor washing machines, and both Zenith and Philco radios. The table appliance field will feature such names as Sunbeam, Proctor and Hotpoint. Throughout the war, manager Elmer Hazie has continually placed emphasis on his repair service. "It's just darn good business," he says. "The best way to develop a customer's confidence is to back up the products he has purchased with good, honest repair service."

Prepared to grow with the future is Kimball Vance, Salt Lake City electrical contractor, president of Electrical League of Utah. Already he has added to his recently opened new office, store and shop, outside the downtown business district at 1063 S. State, to add a motor shop. He plans to merchandise appliances too

Electrical West—Vol. 94, No. 1

That Dream Home of the Rosy Future

*Bill Cyr**

CERTAINLY this is an age of miracles, isn't it? Plastics, radar, helicopters, electronics, television—even a new Bill of Rights. What suckers our forefathers were, to live the way they did, wanting only such simple rights as "life, liberty and the pursuit of happiness." Get that? "Pursuit." They were willing to work for it, pursue it. Imagine that!

Here in America today we know better. Why, even our wildest wishes can come true. All we really need to do is to vote them. Then they become Rights, and come to us from the Left, if you get what I mean.

Fig. 1. It disposes of an age-old problem in a way that will make it stay disposed

Among these new rights which we voted so convincingly in November, remember, was the right, and I quote —"The right of every family to a decent home." That's a perfectly good wish, all will agree. You used to have to work for it but that was in the old days.

It is my rare privilege to tell you about that home, the Dream Home of the Future. I am sure all of you have read of it in the magazines and newspapers. All sorts of experts have been extolling it to the public—and incidentally preparing the people to expect it for immediate delivery, ten days after the war ends, choose your own war.

What qualifications do I have for giving you an authentic prophecy of what to expect? From the following I am sure you will agree that I am as well authenticated as any expert that is handy at the moment and I assure you I will talk even more authoritatively.

A few weeks ago I returned from a trip East—that is Middle-East. Is that not enough in itself? While there I had no opportunity whatsoever to talk to a single manufacturer. Having visited none of the laboratories, I have not been sworn to secrecy either. Unhindered by any facts at all, you see, I am capable of giving you the low-down that is really all-time low on miracles that not even the manufacturers know they are going to make. But they will —mark my words.

It may surprise you, but it didn't me for I've listened to so-called modern music, and looked upon so-called modern art, that some of the foremost surrealists of the world are now sweating their hearts out on this problem, and a good thing too. Mr. Salvador Dali, for example, has been restrained by one of the better manufacturers, as a consultant, and as you know, Salvador is no slouch. His watches may droop over the edge of a table on a hot night, but wait 'till you see what he's going to do to the kitchen. Wow! A Dali's house, no less.

Since I have time only for a few of the more important promissory notes of the Nightmare Home of 194X, Y and Z, I'll skip the details and just give you the fruitcake, shall I?

No doubt you have heard already of such things as high-frequency cooking which cooks in nothing flat. It works from the inside out, and with it we can bake the crust on the inside of a loaf of bread instead of the outside. That will teach kids to avoid crusts—if they can!

I have it on very unreliable information that one manufacturer of water heaters will bring out a new water heater, heated by high frequency in such a way that it will have hot water in the center of the tank while the outside of the tank will remain cool, thus doing away with the need for costly insulation and making it competitive with gas.

Then there are the less-and-less devices promised for the future. First, you've heard of the cordless electric iron, haven't you? That's authentic. It works this way. You set it down on the trick stand, the electricity goes into it, turns itself into heat, which is soaked up in an iron sponge inside. While you iron, the heat is squeezed out.

Doubtless you've also been told that there may be a cordless electric vacuum cleaner. It evidently works the same way. You put it on its stand and the motor goes like the very devil, and then the housewife vacuums like the very devil with it before the motor runs down, then she swears like the very devil when it stops. These modern girls!

One of the lamp manufacturers, I am told, really is going to come out with something. It's a lightless lamp. It gives only black light. Expects to sell millions of them to cocktail bars, necking sections of movies, and they ought to be just the thing for cellar stairs.

But to get into some of the major equipment which you can expect immediately if not sooner.

A Detroit inventor, we hear, has a sleeping machine, which will pack an eight-hour sleep into a mere three

* As presented at PCEA conferences, San Francisco and Los Angeles, Nov. 9 and 17, 1944. Editorial modesty waived in the interest of clarifying this most talked about post-war subject.

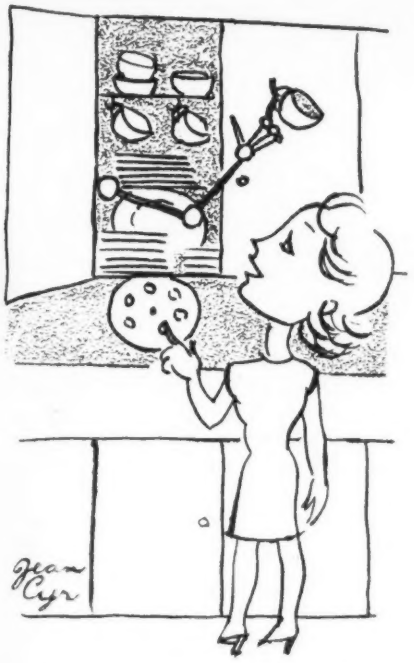


Fig. 2. Dial for your dishes like this

hours by using ultraviolet light, etc. Just the thing for conventioneers and night club addicts who do not roll in until 5 a.m. Another has a bed that quivers, or rocks you to sleep, just like a cradle. Maybe that's what is meant by this "from cradle to the grave" we hear so much about.

Another device is a wall mirror which folds down to make a table. The dishes are built into the table top. After eating, the table is tipped up like a washbasin in a roomette, flushed with water, and the garbage goes down the sewer. Neat and nifty. But the first notable invention to get rid of that age-old problem of dishwashing is being perfected by a famous plastics company I don't dare name. First, let me tell you that you can do *anything* with plastics. You all know that don't you? Where have you been? Also that you can make plastics out of *anything*. Why, up in Idaho they make plastics out of potato peelings.

Well now, let me tell you of the new Dish Disposer which will soon be found in every home or else (or else the salesmanager will get hell from the factory). This advance drawing (Fig. 1) illustrates some of its finer features. You will note that it is not content to invade the kitchen, it goes right out into the dining room or dinette. See that conveyor belt. That's to set the table from the kitchen, in the forward position, or to carry the dishes back into the kitchen in the reverse position. It does away with the servant problem, but the war has shot that to pieces anyway.

Now you see a bold step into the problem of dirty dishes. All the dishwashers before the war left something to be desired. Also something to be scraped off the pots and pans. Well, with this, you see, the dishes, being made of plastic, go in to the all-purpose disposer sink here where they *and* the garbage are chewed up. *But*, taking a lesson from the potato peel in Idaho, the whole works goes through a plastic mill or foundry unit and a whole set of new dishes comes out the chutes —cups, saucers, plates—each from its separate compartment. With this gadget all you have to do is find some food somewhere. That hasn't been solved yet. Note the colored plastic taps at the sink. With these the dishes may be colored to suit any taste. Other taps can give you hot and cold water as well as beer. The line of colored waters is also useful for cake frostings.

To complete the kitchen ensemble there is this new type of kitchen cabinet (Fig. 2) with a full set of electronic controls, which, when dialed, actuate a gooney dooflop valve, actuating a lever arm and out shoots a hand with the dish dialed for. Just the thing for short housewives who can't reach upper shelves.

Now you hear a lot about reverse-cycle heating and cooling, or the heat pump, and there's no telling some of the Eastern experts what it *won't* do. One ingenious manufacturer is secretly working on a reverse-cycle electric range and refrigerator with an offpeak water heater on the side. By bribing one of the designers with a prewar fifth of Bourbon, 4/5th neutral spirits, I have procured a drawing of it which is blown up here. (Fig. 3) You are lucky if the range doesn't follow suit.

See, at the base is the refrigeration compressor, with the cold coils going up into the reefer and the hot coils into the range. To cook you reverse it one way, or to cool, you reverse it in reverse—if you follow me.

A few of the refinements on this combination will interest you, I'm sure. At A you see a trap door which permits you to slide the roast from the refrigeration compartment to the range oven. This can be set to operate on the timer, I may add. And here at P is a real feature. For years we have had a vent from the oven which permitted the escape into the air of stray vitamins and minerals in the fumes. By mounting a precipitron on the vent, this precipitates them and gathers them in a well for gravy. Here's the gravy spiggot, G. Let's see them do *that* with gas!

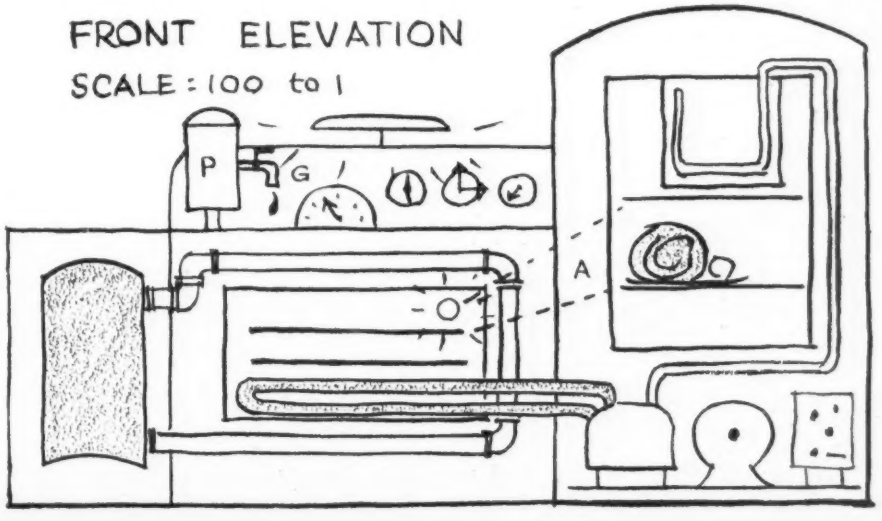
The water heater is operated from waste heat, so you might say it doesn't cost a thing. Instead of insulating the walls of the oven, the water-back coils from the water heater are used instead. They were having a little difficulty with the BTUs, they told me at the plant. Somehow the little devils didn't know which way to turn.

Before someone asks me such an honestly practical question as to how the public is going to pay for all these new devices, let me assure you that too is solved. There will be an automatic bill payer available which can be installed at both front and back door. It comes equipped with an electric eye to sort out the Fullerbrush men and reject them, but to welcome an appliance salesman and let him come in. He has a special frequency, as long as he doesn't make it too frequent.

This electronic device, I might add, is connected by a direct line to the U. S. Treasury through the operation of a New Deal agency for the spreading of the More Abundant Life. Like many other public works it is supposed to be self-sustaining. Don't ask me how. I'm only a Republican.

The radio-television set, of course, will have *everything*—AM, FM and PM with television and facsimile side

Fig. 3. Secret drawing of combination, reverse-cycle, range, refrigerator and tank



orders. There is also proposed a special radar attachment that will come in the more expensive sets, to give warning of the approach of unwelcome guests or relatives the moment they decide to come, and turn off the lights to make you look like "nobody at home" when they drive up. By proper tuning, I am told, this radar will also locate a package of cigarettes or a pound of butter.

Another long needed home electronic godsend is what is called a Regrettor. It is designed especially for those persons whose capacities for regretting are below normal or who, due to various activities, have more to regret than can be conveniently handled without artificial aid. The device can be adjusted to anything from a mild twinge of conscience to black despair. It will also rue—such as ruing the day—like Nov. 7 for Republicans—and can be set at so many pangs per second of high or low amplitude through a pang amplitude frequency control. It is sensitive down to one blue note, yet will run as high as to racking sobs. No home should be without it. It promises to replace the unelectric doghouse completely and I highly recommend it to all of you.

Now you've all heard so much about the automatic washer that I hardly need to describe it to you. But like the dishwasher of the past, none has quite solved the complete problem. Of course, you know of the automatic timing of washing, rinsing and spinning cycles, and a clothes dryer. But this automatic Washer-Presser leaves *nothing* to be desired. Instead of sorting clothes, etc., you walk in and sit down on a chair, as in a cabinet steam bath (Fig. 4). Then this automatic do-all gives you a bath, washes your shirt, underwear and sox, dry cleans your suit and tie, irons and presses the whole assembly, and by sticking the feet out the holes in front, you get your shoes shined by the rotary brushes. Think what this means to the man with one suit or one pair of shorts. He doesn't need to stay home for 14 days waiting for the wash man to come back.

This will give you a rough idea of what we are in for, gentlemen. There will also be completely disappearing kitchens which are rumpus rooms, or living rooms or bedrooms, yet by pushing a button, out pops the kitchen. Push another button and out pops the bed. I can foresee some interesting accidents, such as should you call on friends and thinking to turn on the light you hit the bedroom button by mistake. To your amazement the host's wife might still be in bed.

Before the war we were treated to electric blankets—but they had their limitations. The postwar models, I have been told, will run either hot or cold, or half hot, half cold for double beds.

Fig. 4. Walk-in washer-presser do-all

Yes, indeed, we are in for surprising times in this Nightmare Home of 194X, Y and Z. Yes, indeed, interesting times. Let's see now have I left anything out?

Oh, yes! The wiring!

But that's nothing new, is it? It usually *is* left out, ha ha! Let's see, what to do about wiring? I have it. I understand that some authorities agree that house heating can be done now by heating the walls. Why not just *keep* inadequate wiring to heat up the walls? There's so much of it! For another thing, no need for priorities. Isn't it good to know that we don't need to *not* do anything about it any more?

What a relief—what a home—what a dream!

Radio Division

The San Diego Coast Electric Co.'s special radio division at 629 Eighth Ave. plans to offer a line of industrial electronic equipment after the war, according to Ivan Lauritzen, radio manager. Included will be such items as electronic welding equipment, interoffice communication systems, burglar alarms, and other products which make use of the photoelectric cell. Also offered for the first time will be complete chassis for custom-built radios that will enable repair dealers to place new radios into older cabinets which customers do not wish to discard.

Manager Lauritzen says that he hopes to divide his department into two divisions after the war. One division will be devoted exclusively to the needs of radio repair agencies, while the other will cater to the needs of radio "hams." Of special interest to radio amateurs, as well as others of mechanical bent will be Coast Electric's plan to carry television and FM kits after the war.

Opens at San Diego

Herbert H. Horn Co. of Los Angeles has opened a showroom at 440 Fir Street, San Diego, with Jack Strong manager. Featured line will be the new Admiral refrigerators, home-freezing units, radios, and electric ranges. Also carried will be Eveready batteries, Cinemaster movie cameras and projectors, Corsair color cameras, Sessions clocks, Mastercrafter clocks, Farberware table appliances, Cory coffeemakers, Nu-tone chimes, Thermador electric heaters, Proctor irons, Steam-a-master irons, and Mitchell lights and fixtures.

The Herbert H. Horn Co. gift line was originally adopted only as a temporary war measure, but the response of radio and electrical appliance dealers has been so gratifying as to prompt the company to continue many of these items into the postwar era. With the reputation of being one of southern California's largest distributors of Sunbeam equipment, the Horn company has eight other branch offices and warehouses in the Los Angeles area.

Vacant Lot Survey

As a means of gauging the potential new home building market in the areas served by it, Southern California Edison Co. conducted a vacant lot survey. Surprising results were noted.

A grand total of 121,351 vacant home building lots was found. It was also discovered that some cities and towns, especially those more or less completely surrounded by other incorporated areas, have few lots left and can only expand upward unless substandard houses are torn down and replaced by new. Others were found with large areas in which homes can be built, areas already supplied with streets, sewer and water systems.

With an estimate that 125,000 homes will be built within the five-year period following the war in its service area, Southern California Edison is studying these facts, according to H. C. Rice, manager of domestic sales. He calls attention to zoning changes, that many zone restrictions have run out, others been allowed to lapse. Available lots sometimes are in undesirable districts, already typed by surrounding houses. Shifts in population and trading areas are also noted because all will have a bearing on future distribution.

What's Cookin'

Tastes of things to come in appliance news

● A MIXER for dried milk and dehydrated eggs, one that not only does a satisfactory job without lumpiness, but will be low in price so as to be available to low income families, is being sought by the Department of Agriculture. A meeting with manufacturers of kitchen equipment recently in New York brought the subject to a head. Large-scale manufacturing facilities for dried milk powder and for powdered eggs, occasioned by war needs, should be kept going. Likewise these necessary food products can be produced on an economical scale and made available to low income families for a better diet at lower cost irrespective of seasons. One of the drawbacks is the difficulty of reconstituting, or getting these powders in solution again. It takes a mixer that does not throw the powders to the edges of the bowl to stick there. Both electric and hand driven machines are desired.

● FRIGIDAIRE has been holding a series of winter advanced training programs for experienced servicemen, some of which are yet to be held in Western cities in January and February. Preliminary to the course, conferences were held with the training personnel in Memphis, Chicago and New York. The visual educational material prepared for the course was presented and teaching technique outlined. The training course covers a five-day period, the first four of which are on refrigeration equipment, the last on electric ranges. E. D. Davis and L. L. Perry of Denver attended the Chicago conference. Denver had the course the week of Nov. 13, Portland Nov. 27, Seattle Dec. 4, Spokane Dec. 11. El Paso was to have one Jan. 8, Los Angeles Jan. 15, Salt Lake City Jan. 22.

● HOTPOINT's postwar merchandising plan is ready, according to Ward R. Schafer, who said that in large cities the line would be handled by "key accounts" such as large department stores or utilities or major dealers, with smaller dealers likewise having a place in the picture. The complete kitchen will be stressed in displays in dealer stores of operating kitchens, including electrically lighted metal wall and base cabinets, refrigerator, range, water heater, sink with garbage disposal and automatic dishwasher, home laundry with washer, dryer and ironer. H. J. Scaife, Western regional sales manager, held meetings in Seattle, San Francisco, Salt Lake City and Los Angeles, addressed by Floyd Slasor, manager, refrigeration and department store sales divisions.

● SPRING MARKET WEEK, at the Western Merchandise Mart, San Francisco, will be Feb. 5-10, and will combine with it the Western gift and art market, part of which will be at the civic auditorium, a half block away, Feb. 8-11, inclusive. No electrical merchandise is expected to be available, with the possible exception of irons, war model ranges and vacuum cleaners. Many well-known appliance companies and distributors are returning to the Mart as space becomes available, preparing for the day when merchandise will flow again. Considerable activity in signing of franchises and seeking them is expected at this market. Giftwares have tided many electrical dealers over the war period and will be in demand by them still.

● SHERMAN-SWENSON & Associates, with the distributorship for Electromaster ranges and water heaters, Deepfreeze home freezers, Farnsworth radios, Duotherm oil burners, and Adel Precision home appliances for southern California, has opened offices at 2436 East Eighth St., Los Angeles. H. E. "Shorty" Sherman and Louis R. Swenson, both well known in the distribution field, are partners in the company. Offices in San Diego are contemplated later.

● BENDIX SUES BENDIX—When Bendix Aviation Corp., once the parent company of Bendix Home Appliances, Inc., announced recently that it would manufacture radios postwar, the latter, now a separate company, sued the former, contending that it held the rights for the use of the Bendix name in the manufacture of any home appliances. The courts of New York will now be asked to decide what limits may be set upon the use of the Bendix name by the two organizations.

● STEWART-WARNER says it can produce civilian radios within 60 days after government restrictions are lifted, without disturbing its war orders for radio and radar equipment. It plans to use its former refrigerator assembly plant, now a shell fuse plant.

● W. J. KERN, General Electric appliance service center manager, San Francisco, returned recently from an annual conference at which the field training program for 1945 in some 150 training schools attended by some 6,000 dealers and service men was previewed. Availability of parts is much improved, he reports.

● PROCTOR recently submitted its postwar designs for toasters to a testing for appearance to shoppers in Macy's housewares basement in New York as a means of determining which held the most appeal. Models of several designs, shifted in position frequently to make the check accurate despite relative position, were shown and votes taken on the preferred design. Prewar designs were also shown.

● CANADIANS expect some manufacture of washers and radios in 1945, according to opinions reported by Stanley Wright, Wright's Ltd., New Westminster, B. C., after return from a trip to Eastern Canadian factories. The opinion was that domestic appliances and furniture might be in general production within six months, radios not until late in the year.

● WESTERN RADIO & APPLIANCES, a new magazine, was announced by Phil Battelle, Battelle Publishing Co., which publishes Western Home Retailing. The appliance trade magazine is making headquarters at the Western Merchandise Mart, San Francisco. First issue was due Jan. 1, 1945.

● EUREKA VACUUM CLEANER Co. has been given WPB permission to start making both its vacuum cleaners and the newly perfected cordless electric iron. Total authorization for irons was 451,000 for the year; for vacuum cleaners 140,000, each with quarterly quotas.

● KELVINATOR's vice-president, Charles Lawson, has announced that his company expects to build a home freezer to cost "something less than that of the average good refrigerator." This prediction is based on the company's experience in the ice cream freezer cabinet field.

● WESTINGHOUSE has prepared a new reference handbook on home appliances especially designed for teachers in home economics and home management. The revised manual includes new sections on electricity in the home, the automatic washing machine, home freezers and clothes dryers.

● HARVEY MACHINE Co., Los Angeles, announced, through its Victor Halperin, that it would enter the field to produce dishwashers, radios and clothes dryers. The announcement was made at the San Diego bureau meeting described elsewhere in this issue.

● BEN T. ROE, recently arrived from Crosley, now heads the appliance department for the J. N. Ceazan Co., distributor for Crosley in southern California.

Take The Blight from Industrial Light

In letter to his brother, lighting in the "good old days" is compared to the scientific balanced lighting in a modern war producing plant

W. C. MACY
Pacific Gas and Electric Co.
San Francisco

DEAR Brother Alan:
How goes the power business back there on the Hudson River?

Here it is, just 20 years since I packed up and drove out here in a model "T" Ford over some of the worst roads imaginable.

I well remember my last job back there in Building No. 49 on the old Erie Canal, particularly the poor industrial lighting under which we had to work. And that's what I want to talk to you about—not about the lighting in that particular shop—that has been modernized according to recent reports—but about adequate industrial lighting in general.

Are the findings of the past three years having any effect on plant management men?

Is adequate plant lighting being given serious consideration by both the employers and the employees?

Are the facts relating to so-called adequate lighting as against average plant lighting being aired generally?

Where definite improvement in production, safety and working conditions has been proved so often during the past three years, it will be a national loss if both employers and employees do not take advantage of the knowledge gained and do something about it.

A year ago I collected data on a relatively small plant here which made the recommended lighting changes. It showed an estimated minimum production improvement of 15%. Hazards due to inadequate lighting were completely eliminated and there was a marked betterment in working conditions. A most definite improvement was noted in the workers' physical condition at the completion of shifts—to which some of them attested most heartily.

What about employee morale? We both should know something about that. What more important is there on a good job with fair pay than that the major working conditions be good? Ability to see ranks close up to the top of the list. Our daily travels here take us into many industrial shops and the "64-dollar question" which I get from the boys on the machines is—"When are you going to get the boss to put in some decent lighting?"

This uphill fight to enlighten folks to the real value of adequate light for seeing in industry sometimes gets pretty discouraging, Alan, and yet the relatively few who do take advantage of our services to make substantial gains encourage us to keep it up.

One of our greatest hurdles is the fact that we are "selling the power" and therefore are looked upon with some degree of suspicion. Sure, we'll make more money for the company by increasing the load, *but* for every additional dollar for current, the average industrial customer makes *plenty, if he carefully follows the proper recommendations without compromise.*

After the war there promises to be many more industrial firms (for a while) and I predict that those who "make the grade" will have to pay more attention to and practice more efficient, up-to-date methods. *Engineered adequate illumination* has more than proved itself during the past three years of war effort, and perhaps we will be able to reach the ears of many industrial employer and employee leaders.

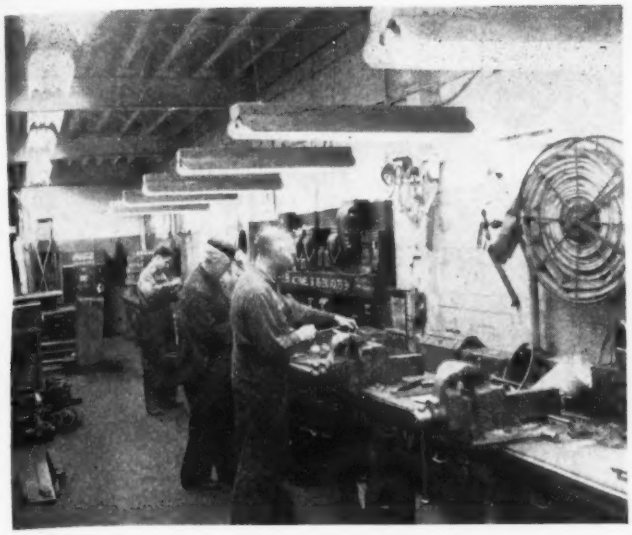
Some plants get into ruts and fail to accept modern techniques. Sometimes they fail and go out of business. Sometimes they slow down to the point where they are glad to sell out to more progressive organizations.

I would like to tell you about one "old timer" plant here that refused to stay in the rut and did something about it. Of all the changes that were made, I shall discuss only those which had to do with illumination.

This company is known as the United Engineering Co. The shops I'm

Before relighting, the machine and assembly shop was typically dark, average general intensity 8 f-c and localized intensities up to 60 f-c from the drop cords

After relighting, average intensity was 30 f-c from high-bay units above craneway and under crane, and from 200 to 400 f-c on all the work at the machine tools



Work bench lighting was first installed parallel to the bench but, by placing some at right angles, the intensity was raised to 30 f-c and the shadows were eliminated

Deep bins and shelves contain tools. Markings are now easily read for accurate checking, errors in selection are reduced and time consumed lessened by 30 f-c lighting

thinking about are those located at 298 Steuart St. in San Francisco.

In this set of shops the lighting in three particular areas was completely revamped: (a) the old machine and assembly shop No. 1; (b) the tool and die making room; (c) the tool and stock room.

What we found and what was done to correct it is in the accompanying tables.

FOUND

1. Machine and Assembly Shop No. 1

a. Average general intensity.....8 f-c
b. Avg. localized lighting intensity..60 f-c
c. Source glare .....bad
d. Reflected glare .....fair
e. Shadows .....bad
f. Time factor .....bad
g. Color of surfaces.....very dark
h. Outside glare conditions.....bad
i. Safety complaints had been made
j. Employees were most conscious of the poor illumination and expressed themselves freely
k. Brightness contrasts .....bad
l. General over-all dimensions..58x135 ft.

2. Tool and Die Making Room

a. Average general intensity.....8 f-c
b. Avg. localized lighting intensity..60 f-c
c. Source glare .....bad
d. Reflected glare .....fair
e. Shadows .....bad
f. Time factor .....bad
g. Color of surfaces.....very dark
h. Outside glare conditions.....bad
i. Safety complaints had been made
j. Employees were most conscious of poor lighting and said so.
k. Brightness contrasts .....bad
l. General over-all dimensions...58x28 ft.

3. Tool and Stock Room

a. Average general intensity.....5 f-c
b. Source glare .....bad
c. Reflected glare .....fair
d. Shadows .....bad
e. Time factor.....very bad
f. Color of surfaces.....bad
g. Outside glare conditions.....fair
h. Employees couldn't readily check markings on tools and mistakes crept in.
i. Brightness contrasts .....bad

TREATMENT

1. Machine and Assembly Shop

1,500-watt high-bay units were mounted in two rows above craneway to give even distribution.

Two 1,500-watt high-bay units, with shock absorbing sockets, were mounted on the crane to eliminate shadows caused by the crane when directly below the overhead units.

Special type "MC" and "MX" localized lighting unit, employing PAR.-38 and R-40 spot and flood lights were mounted on all power machines to provide from 200 f-c to 400 f-c.

The ceiling, upper walls, trusses and columns were painted a flat 85% reflection factor white.

All windows were darkened.

Above the benches, fluorescent 48-in., two-lamp units were installed on 6-ft. centers, at right angles to the front edge of the bench and 6 ft. 8 in. above the standing level.

Under the 12-ft. mezzanines, 60-in. two-lamp fluorescent industrial units were used to provide the general illumination.

Each power machine was studied for the best possible position for the localized lighting units.

Each power machine operator was quizzed as to the condition of his eyes and different intensities were tried in some cases where it was found necessary to suit carefully the intensity to the individual's light requirements.

2. Tool and Die Making Room

Three continuous rows of 48-in. two-lamp industrial fluorescent units were mounted at 10 ft. above the floor on 10-ft. centers.

Eight 300-watt, silver bowl lamps within circular metal glare shields were mounted at 11 ft. above the floor in order to brighten the ceiling and reduce brightness contrasts in the surrounds.

Type "MC" and "MX" localized lighting units were mounted on the power tools to provide from 250 f-c to 700 f-c, depending on the nature of the seeing tasks.

The ceiling was painted a flat 85% reflection factor white.

The upper walls and columns were painted a 65% reflection factor flat buff.

The lower walls and columns were painted a light gray utility color.

The windows were equipped with venetian blinds.

3. The Tool and Stock Room

48-in. two-lamp industrial fluorescent units were mounted at 8 ft. above floor or just above the top rows of the shelves and bins for general lighting.

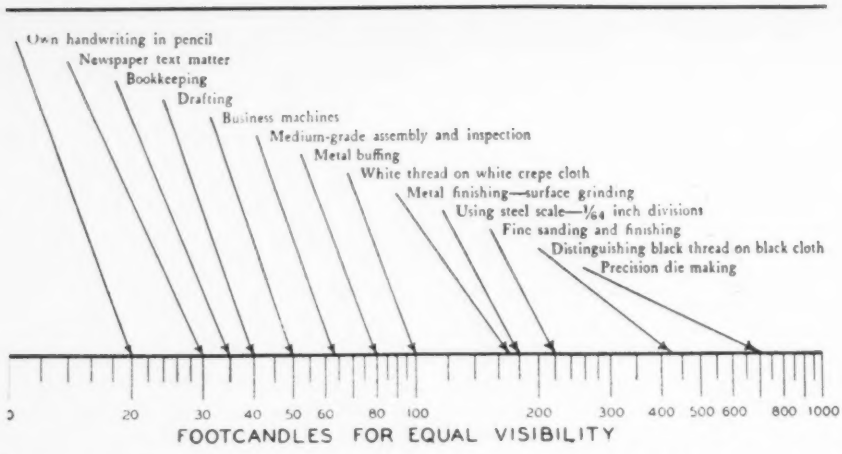
The same painting scheme was followed as in the tool and die making room.

High Intensities for Precision Work

One particularly interesting phase of this reconstruction had to do with the relatively high intensities provided for localized lighting. We followed the requirements as set forth in a chart by "Luckiesh and Moss" contained in Bet-

RESULTS

	Machine & Assembly Shop	Tool & Die Making Room	Tool & Stock Room
a. Average intensity	30 f-c	55 f-c	30 f-c
b. Local intensity	200-400 f-c	250-700 f-c	none
c. Source glare	none	none	none
d. Reflected glare	satisfactory	satisfactory	none
e. Shadows	satisfactory	satisfactory	none
f. Time factor	good	good	good
g. Color—surfaces	good	good	good
h. Outside glare	satisfactory	none	none
i. Safety conditions	good	good	good
j. Morale	good	good	good
k. Brightness contrasts	good	good	good


Own handwriting in pencil
Newspaper text matter
Bookkeeping
Drafting
Business machines
Medium-grade assembly and inspection
Metal buffing
White thread on white crepe cloth
Metal finishing—surface grinding
Using steel scale—1/64 inch divisions
Fine sanding and finishing
Distinguishing black thread on black cloth
Precision die making
20 30 40 50 60 80 100 200 300 400 500 600 800 1000
FOOTCANDLES FOR EQUAL VISIBILITY

Illumination required on various tasks to be as visible as 8-pt. type, 10 f-c

ter Light—Better Sight News, volume 12, No. 4, December 1943.

For "precision die making" the chart shows a required intensity of 700 f-c. This is not so light when compared with the average of 1,000 f-c under a shade tree on a clear day.

Provision was made to get 700 f-c by using an R-40, 300-watt spot lamp in a Type "MX" adjustable unit.

Previously it was felt that such an intensity was altogether too high for power tools but an incident occurred last winter that upset our opinion.

The U. S. Navy had purchased some 50 of these same units to be used in the new Hunters Point Navy Yard machine shop. A mistake was made in ordering the lamps and "spot" lamps arrived instead of "flood" lamps. The difference was not noted at the time of arrival and these lamps were installed in the units.

The machine operators were high in their praise of the units, and then the error was discovered. They wanted to keep the unusually high intensity and it worked.

The machine operators at the United Engineering Co. plant have reacted identically to those at the Navy Yard, and are now using the same unusually high intensities with evident satisfaction and enthusiasm.

This plant was visited many times following the completion of this change in the lighting in order to get the reactions of—

1. Operators on both day and night shifts.
2. Foremen on both day and night shifts.
3. The general foreman.
4. The plant superintendent.

Some of their remarks are to be found along with this letter. They speak more eloquently than I can.

And so you see, Alan, that there is plenty to this business of lighting industry for production, safety and morale.

These men who were interviewed, and are named, are real people. No words were put in their mouths. The question asked of each one of them was: "Has the new engineered lighting installation in any way aided production, safety or morale?"

Each man was warned that his answers might be quoted, and to give only his sincere convictions based on the actual facts as he saw them.

These men are regular folks, like the men back there in shops like Building 49 on the Erie Canal.

I well remember when we used to discuss the lighting on the night shift in the summer of '23.

There was "Scotty," who broke me in to the mysteries of leveling blocks to support the turbines, "Charlie from South America," who picked the lucky combination of numbers on the baseball pool, the Irish lad who was in on the ticket and then had his wife come over from the old country, and many more real fellows.

The lighting as I found it in the United Engineering Co. reminded me very much of the old lighting back there in Building 49, so much so that I knew just what the boys here were thinking when I walked in and saw what they had to contend with.

But what about all those other average-lighted plants, both out here on the West Coast and back there in the East?

The great majority of them are still struggling along with 1923 type lighting systems, and that amounts to a tremendous economic waste in time and materials.

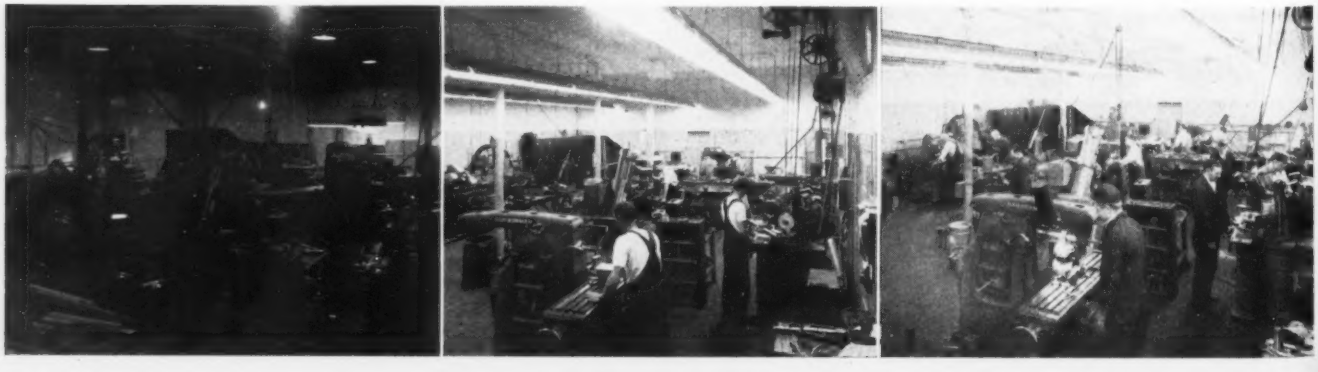
I have dug up and set forth to you the facts about this recent plant lighting correction as one more example of what can be done, what actually has been done, in the hope that the torch may be made to burn just a little brighter and thereby attract the attention of a few more employer and employee leaders in industry who "have to be shown."

Here's to "de-blighting poor lighting."

As ever, your brother,

W. C.

Three stages in lighting of the tool and die making room —At left, original lighting, producing about 8 f-c, one or two fluorescent local lighting units and drop cords. At center, after installation of three troughs of two-lamp 48-in., F-lamp industrial units. Brightness contrast between units and ceiling and needed additional light on the work still caused strain. At right, the final lighting, with eight 300-watt silver-bowl lamps in circular glare shields to illuminate the ceiling and individual high-intensity local lighting units added at each machine



What the machinists and supervisors themselves say about it

R. D. JONES, machinist, day shift, 52 years experience. (Once a shop superintendent before retiring before the war):

I do better, faster and more accurate work since the lighting was changed.

I often work to .002 in. tolerance, and less, and this lighting is many times better than before.

I had a job this morning to file down to .001 in. tolerance, and it was easy.

It is easy enough to turn out 20% more good work with the same effort that it used to take.

I saw my oculist the other day and he noticed at once an improvement in my eyes.

I used to look across the shop and wonder how on earth the fellows on the main floor could do anything. Now we can see well anywhere in the shop.

Increasing the effectiveness of good workmen on the job by 20%, men who know the run of the shop and men whom the shop knows and understands, means more than going out and hiring 20% more of equally good workmen; and that's a low estimate.

M. ALBEE, foreman, swing shift:

Now I can see where I am stepping.

When moving materials, we can now see what we are doing.

We can now see marks, scriber marks and details.

Now it is not necessary to use blueing for scriber marks.

There is now no eye strain and a man can read "mikes" easily.

The crane lights are excellent. They prevent the crane from blocking the light.

There are less errors by 50%, and 90% of this gain I attribute to better light.

It is easy to get 20% more work out with the same effort as before.

There used to be 30 to 40 extension light cords around the floor. Now there are less than half a dozen.

The outlook is brighter for the men; 75% of the night shift men have been with us for three years and some of them are 65 years of age. They can work much more easily and much more effectively, and they appreciate the improvement.

Here is an old "mike" that is badly worn. You can read every mark on it.

With more light it seems warmer—probably due to being able to move around the shop more rapidly with safety.

Major conditions are more important than a differential in money. We could go "up town" for an average of 20% more wages, but we stay here.

My men take a pride in doing a good job. Having to "fight the job" because of improper light, ruins jobs.

When I go over to our other (new) shop across the street for an hour on occasion and then return, the men are all at their machines and working. They take a pride in the shop and their job because physical conditions are right. Their spirit is excellent and that's the reason we get things done.

WM. LANDUCCI, machinist, night shift:

My eyes used to burn quite a lot at one time, before these lights were put in, and I only had a bright light hanging down on a cord. Now my eyes feel fine.

The hardest task was to see scribed lines. Now it is a lot easier.

In the tool making room here, when the top incandescent lights which light up the ceiling are off, there is an eye strain which is quite evident.

Without any greater effort we can get at least 10% more done now with the better light.

As far as seeing obstructions in the aisles or around the machines, there is no longer any reason for faulty light to contribute to accidents.

On overtime work, lack of proper light tires a man badly. We can now work overtime with much less fatigue.

Poor light makes me very tired because of having to fight the work and the poor light conditions.

I am on the swing shift and working in the tool and die department. When working on bright metals with these new light sources, there are no shadows or glare because the light around about the work is even.

The local lights for machinery, where I must see in dark holes or under obstructions of the machine itself, are absolutely necessary.

The old style local lights used to "gum up" and couldn't be cleaned because the cutting compound would bake onto the metal reflector. I used to paint these reflectors with aluminum paint without very good results. This new light has its own reflector built right into the bulb. When it gets dirty, the bulb can be replaced and we automatically get a new reflector.

These units don't get dangerously hot. When we touch them accidentally with our face or arms we don't stick there and get burned.

The covers of the light don't glare because they are painted a rough black. The old ones used to glare when they were new and when they became "gummed up" they didn't glare or give enough light in any direction.

Around about any job there are really two things that are important, one is fair pay and the other is prime conditions about the job. The major conditions are: no draft, cleanliness in the shop and lavatories, right temperature and warm floor, wooden mats to stand on where the floor is concrete or steel, and, of course, good light to see by. What good would unusually high pay be if my health was in danger? I'd rather have good health first with reasonable pay.

S. RIZZA, machinist, day shift:

That is my picture at the vertical turret lathe and here are my remarks for what they are worth:

Good industrial lighting means to me:

a. Better work;

b. Better eye sight;

c. Quicker work;

d. Easier on the nerves;

e. More pride in each job better done—for both the boss and myself;

f. Saves time and expense and aids the war effort;

g. This local unit, together with the new general light, is the best I have ever seen or worked under;

h. At the end of the shift I don't feel nearly so tired as I did with the old lighting;

i. My machine is worth plenty, why not a good light on it?

j. The work definitely depends on good light by which to see;

k. Of the working conditions about my machine, if any *one* had to be chosen *alone*, it would be "good light";

l. If I had to choose between good light with fair pay and the poor average light with higher wages, I would take the first. This is serious—good light means a *lot!*

m. After the war we'll never go back to the old conditions. "There'll be a lot of changes made."

BERT NICHOLS, machinist, day shift:

It is much safer at nighttime and some safer in daytime.

There is less eye fatigue and a man's personal movements are naturally speeded up.

My guess is that a man can do better by a definite percentage.

The better light certainly saves material and tools.

All of the men have agreed that it is a much better shop to work in with the new lights.

Complaints on poor lighting have all disappeared.

The change to better lighting conditions has made a hell of a difference. This was the biggest single improvement here since 1915.

CLARENCE NIEHAUS, general foreman:

We can now see the aisles clearly and no one bumps into things.

The corners are light.

It is much easier to pick out materials.

Tools can be much more quickly found.

There is not so much chance to lose tools.

Readings on micrometers and scales can be easily read.

Workers can move around quicker without danger.

Accidents have been cut down about half.

There is about a 20% increase in production due to the fact of the better lighting conditions with less errors.

About 20% less mistakes are made now, due to the better lighting.

Lighting has improved the morale of the men 100%.

Foremen feel better due to not having to spend so much energy on just plain "encouragement" to the men.

The lighting has cut down considerable of the "beefing."

Absenteeism has cut down since the lighting conditions were corrected.

The cost of the change is obviously being rapidly paid for in the more efficient work of the men.

I'd make the change right over again if we had the old conditions.

I am convinced that the benefits afforded by the new lighting far outweigh any cost of having it installed.

The major conditions of light, heat, ventilation and hygiene mean much more to the worker than wage problems.

HARRY WAGNER, general shop superintendent:

Due to the improved lighting conditions, there is now no reason for accidents from poor visibility.

I feel satisfied that an average good machinist will produce at least 10% more work than he would under the old conditions.

A man has more confidence in reading precision tools due to the fact that all lines on the instruments and machine tools are clearly visible.

The available skilled mechanics average about 45 years of age today; necessarily they require better lighting than younger men whose vision is much better. This makes it all the more important to provide good lighting on power machines while the available trained manpower is so restricted.

Employees working on the night shift, work in our shop in preference to better paying jobs, since the new lighting system has been installed.

"As Long As You're Changing The Code--"

Some suggestions right from field experience that should be considered by Code framers, made to the Southern California Chapter IAEI

J. G. Moyen

Electrical Engineer, Square D. Co.
Los Angeles

THERE seems to be an impression, shared by many in our own industry, that the many advances made during the war period in new methods and materials in a large measure will do away with a lot of old problems which confronted us in times past.

The purpose here is to discuss two or three of the undesirable and inefficient methods that we have come to accept in the past and take for granted. If we bring these things to the foreground now and make up our minds on them, and take proper action we may be able to forestall some future difficulties, and our efforts will result in further improved installations.

30-amp Service Switch

Number one on my list is the use of the ordinary 30-amp. enclosed switch as entrance device for a resistance. As near as I can learn, there has been practically no change in Underwriters' Laboratories specifications for these particular switches since the time that loom was commonly used to cover and protect the wires. At that time No. 12 wire was often used for service entrance conductors, and it was not important to provide any especial amount of wiring space within the cabinet.

However, with the coming of conduit, No. 8, three-wire service conductors, grounding bushings, locknuts, ground pipes and conductors, connections and jumpers to the neutral plate, and sometimes even meter loop wires, these cabinets are now entirely too crowded for practical use. When completed, the device, although listed as an enclosed switch, besides being a switch box becomes also a pull box, connection box for service wires and ground, even a distribution cabinet.

Strangely, about everyone in the industry recognizes the inadequacy of switch boxes to house all of these things, and we all agree that something should be done about it, but so far nothing has been done to correct the situation. The manufacturer cannot sell his 30-amp. switches, unless he makes the boxes too small for practical use. He probably blames the contractor for using it and the inspector for allowing it to be used. The contractor probably buys the small boxes because they are cheap and competition more or less forces him to use them. The inspector probably blames the manufacturer, contractor or Underwriters' Laboratories, for this condition. So we have a vicious circle of condemnation.

Now take the owner's part in the whole picture. Usually he is not an engineer and knows little or nothing either about the electrical system in his home or that which is to be built into his home. But, if asked, probably 99% of such owners would answer that they wanted a wiring system by which they can take advantage of the great number of "wonder" electrical devices that they and we believe will be forthcoming as time goes on.

We should also be reminded that the consumption of electricity is still in the ascendency and the end nowhere near in sight. It is entirely different in this respect from gas and water uses, which have probably reached saturation.

The owner, therefore, must rely on us for his needs. He certainly will be sadly disappointed in all the "experts" in the electrical industry if he has to begin tearing into the wall of his home in order to get needed service capacity as soon as he wants to use anything beyond that of bare necessity. Therefore, if we profess to be serving the public, we should not feel that we are forcing something on them by insisting on a higher minimum of service capacity than at present. On the other hand, we should feel it our duty to act somewhat as an agent for the public to anticipate for them what they unquestionably want.

Look at any installed 30-amp. switch. It will give a fair picture of what is now generally used. It is a poor advertisement for our selling ability for adequacy. Breaker boxes are more modern and have a minimum clearance for 70-amp. service under U. L. standards. Fusible equipment, of course, could be made equally acceptable. The advantage of using the six-circuit rule is to tend to put entrance equipment inside the house where it really belongs.

Even a 60-amp. or larger switch does not necessarily make it a lot easier to add capacity to a building once the installation is in. Our experience has been that the best solution at present is to interest contractors or owners in taking advantage of the provisions in the National Electrical Code (Sections 2351a and 2371a-3). Of course, either fuses or circuit breakers may be used in this set-up, but the minimum rating of the unit that about five of the principal manufacturers of circuit breakers are offering is rated 70-amp. for the mains. This automatically forestalls anyone trying to chisel down the capacity of the entrance equipment to a ridiculously low figure.

Without attempting to argue as to who is responsible for the present status (probably we just grew into it), I believe that the initiative in remedying it rests with the electrical inspector. If he can require a minimum size for entrance cables and conduit, pull boxes, etc., why can he not (in view of the necessity) specify a minimum size for the entrance cabinet, depending, say, on the size of the house. I would suggest that chapters appoint committees to investigate this matter, which committees, if sufficiently impressed, would word a letter, acceptable to the chapter, and forward it through the secretary to other chapters and sections. The committee could continue its activities until section action was taken and until the Code includes some rules which remedy the situation.

Electric Range Protection

Another practice which I wish to discuss is that of "protecting" electric range circuits, heating elements, switches and small wiring, with nothing more than the main circuit protection—generally rated at 50 amp. This main protection is designed to care for the No. 6 wire which feeds the range, but is in no way adequate to protect the individual parts of the electrical circuits within the range.

So-called short circuits which occur in ranges are very seldom a direct short between the main wires, and consequently will not draw enough current from the mains to cause the overload equipment to function. Fifty amperes at 240 volts is 12,000 watts and, if all this energy happens to be expended in

one switch or small element, we can easily start a fire without even causing an overload on the mains.

Furthermore, fuses and, even more so, circuit breakers have a great deal of time lag under overloads, so that short-time loads of several times normal rating can be carried. This accounts for the heavy shorts that sometimes occur on these circuits, often starting fires and badly frightening the occupants of homes.

All this is very bad publicity for the electric range, and these occasions of failures are becoming so common, I believe, that unless some remedy is forthcoming soon, we are going to have a hard time to sell the ranges we hope to sell after they are again on the market. I understand that wires as small as No. 16 or No. 18 are often used within the range. Furthermore, the bakelite bases of the switches are often the causes of short circuits or partial short circuits.

The obvious method actually to protect all of these circuits would be to provide fuses or breakers of proper capacity for each circuit. This procedure might, of course, increase the price of the range, but I believe that it would be far better to sell some fewer ranges at a higher price than to continue to allow improperly protected ones to go on the lines in large quantities.

Here, again, is a case which will be remedied only if the electrical inspector complains long enough and loud enough. This is a distinct case of fire and accident hazard which we should all go to work on, if it is really our duty to make electricity safe and convenient.

Diversity vs. Connected Load

Another item, though this has to do with waste of materials and labor, is that of piling up the capacity of services and feeders in industrial installations and war plants, without a sane regard for the combined demand factor of the connected equipment. If we consider only the total connected load in these plants and then apply an applicable demand factor, as indicated in the Code, we are likely to arrive at a figure which is out of all proportion to that which we will find if proper instruments are used to read the load. This practice results in an enormous waste of copper, conduit and labor, and unwarranted expense to the owners.

I know of a factory installation which has a connected load of about 1,200 hp., yet the demand load never exceeds 150 hp. If the Code were actually enforced, the consumer would need to enlarge his service entrance capacity maybe 200 or 300%, with all the attendant waste of materials and labor. No doubt the power company would not increase its transformer capacity correspondingly, because it generally uses demand indicators or other instruments in order to learn the actual values of the load.

This low average demand is especially true on spot welder circuits. I know of a spot welder feeder circuit which has fuse protection that is really smaller than that required by the Code for a single spot welder, yet the owner has added three more spot welders to the same circuit, and the fuses have never blown up nor the wires ever shown the slightest rise in temperature over that of the room.

Obviously, voltage drop must always be taken into consideration, but after allowing for this, I do not see where the inspector has a real right to require several times needed circuit capacity. I realize that an inspector cannot make periodic inspections to see that the load has not increased over his previous visit; however a good solution would be a provision that a consumer, at his own expense, could install demand indicating devices on his service or feeders, which would show the highest 15-minute demand. I know that such a provision in the Code in many cases would save the consumer thousands of dollars in his electrical installation.

No. 12 Wire

Cooperation of chapters with the adequate wiring committee of the Pacific Coast Electrical Assn. will result in much mutual benefit. The inspectors association has an opportunity for observation of actual working conditions and the means for bettering the Code, while the PCEA has the means for contacting the public and giving it information regarding electrical installations. It can create an interest in it.

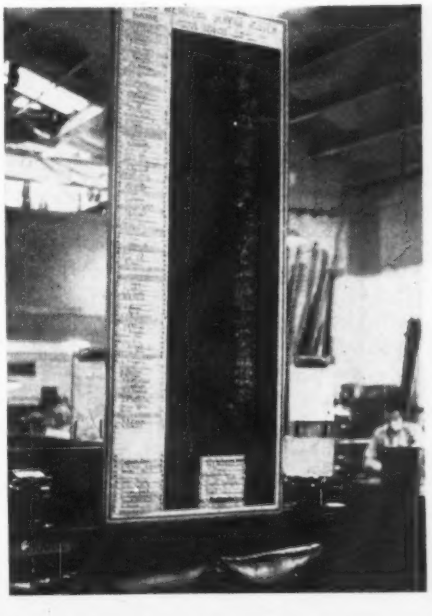
The recent suggestion that nothing smaller than No. 12 wire in residence circuits be used, is an excellent one. If the electrical contractor made a good analysis of his costs, he would find that the extra accounting and labor costs for bothering with two different wire sizes costs him more than he saves. If by mutual effort we could cause him to understand this, he would make this change automatically and without any Code change.

● Street Lighting Plan Book—The street lighting section of the National Electrical Manufacturers Assn. has prepared and is distributing to utilities a plan book containing much material which it suggests the utilities themselves make use of in plan books of their own, adapted to their own specific cities and areas. Stressing the need to plan in advance for future street lighting development in order to increase the safety of streets at night, the manual contains valuable charts and diagrams useful to any utility or city. That many municipalities are planning now for postwar street lighting expansion makes the issuance of such local manuals timely, it points out. Especially valuable are the pages listing benefits to community and to motorists from safety lighting. Likewise dramatic are the figures on accidents, the photographs, the charts, and useful are the analysis sheets and summaries of costs, specifications, etc. contained in this manual.

● Prices for the new slimline lamps announced last month by General Electric Co., and later by Westinghouse Lamp Department, now listed on the supplementary and large lamp price list, are as follows: 42T6, 42-in., $1.55; 64T6, 64-in., $1.75; 72T8, 72-in., $2.00; and 96T8, 96-in., $2.70. The lamps, available only for experimental and design purposes at present, are available in white only. Initial efficiency is 60 lumens per watt, life 2,500 hours at three-hour burning per start, operating at 100 ma.

● Evanston, Wyo., has a new street lighting system, recently completed by Utah Power & Light Co. The system includes 22 23-ft. fluted steel standards with 6-ft. upsweep brackets extending over the street. Use is made of a new type of luminaire designed for highway safety, throwing 40% more light on the street than older types. Luminaires are lamped with 6,000 lumen lamps, 10,000 lumen at intersections.

California Electric Works, San Diego, has this shop bulletin board with employee names, listing their entry into armed forces, civilian defense work, bond purchases, and blood donations



EMEA *Dope Sheet*

Ball Bearing Lubrication

Prepared for EMEA of Southern California

*Harold Davis, Jr.**
General Electric Co.

ESSENTIAL functions which a ball bearing lubricant should perform are:

1. Protect the surfaces of balls and races from rust or corrosion.
2. Prevent friction between balls and retainer.
3. Improve enclosure.
4. Assist in heat dissipation.

These requirements eliminate the use of all lubricants containing acid, alkali or sulphur, which, instead of protecting, would inevitably pit or etch and thus seriously injure the highly polished surfaces of balls and races. Therefore, vegetable and animal oils, which are likely to gum-up, become rancid and develop acid, are not suitable for ball bearing lubrication and should never be employed for this purpose. Also lubricants containing solids such as talc, pumice, or graphite are decidedly unqualified for ball bearing use, since the oil in which they are suspended is gradually lost through volatilization and the solid substances then tend to accumulate in the races obstructing the free rolling action of the balls.

The proper type of lubrication, oil or grease, is directly dependent upon the details of the housing design, together with the particular condition attending the operation of the equipment. A given housing design *cannot* be used alternately for either oil or grease. Oil lubricated ball bearings were covered last month.

Grease Data

One of the first axioms of ball bearing lubrication is not to mix greases which are of a different type or specification. If a change in grease is to be made the bearing housing should be completely cleaned.

Following is the specification of a grease acceptable for ball bearing use:

Worked consistency — 300 to 320 mm/10 (ASTM D-217)
Flow point—280°F. Min.
Mineral oil—79% min. 220-440 viscosity at 100°F.
Soap base — sodium-calcium, separately or in combination.
Free alkali—0.30% max. (as NaOH)
Free acid—nil
Water—0.20%
Ash—5.0% max. (as sulphates)
Color—amber

In addition to the above properties, a good grease should not increase in hardness more than 15 or 20 points over the consistency figure, either when standing in containers for long periods or when used in the motor. It should not separate readily into oil and soap, should not rust or corrode metal surfaces, and should be suitable for operation in a temperature as low as minus 25°F., and as high as 175°F.

For small, ball-bearing motors operating vertically, a harder grease with a worked consistency of 260-280 mm/10, should be used.

The above recommendation does not apply to double-sealed ball bearings which require special grease, selected and recommended by the ball-bearing manufacturer.

Grease vs. Oil Lubrication

Grease is superior to oil in two important respects:

1. Grease does not have the tendency to leak out of housing.
2. Grease helps to seal up the clearances of rotating and stationary parts at the shaft openings.

Disadvantage of grease:

1. Poor greases at high speeds and temperatures are subject to separation, drying out, decomposition or oxidation, which may cause the bearing to become rough, bind, lock or possibly fail.
2. The ever present possibility of overgreasing.

Preparation for Greasing

Dirt, lint, grit, dust, etc., are the arch enemies of a ball bearing. It is all important that dirt does not enter a bearing while greasing. The maintenance man can prevent this by observing the following:

1. Keep the cover on the grease can, removing it only for the short interval that grease is being taken from the can. Do not lay the housing cover where it can pick up dirt.
2. Make certain that the instrument with which you take the grease from the can is perfectly clean. Avoid the use of a wooden paddle. Use instead something with a steel blade like a putty knife, which can be wiped off smooth and clean.
3. Wipe off the fittings and nozzle when using a grease gun. When housing covers are to be removed, first wipe off all dirt.

Pressure-Relief Method

To determine the correct amount of lubricant in ball bearings is one of the most important problems in motor maintenance. Too much lubricant in these bearings can cause heating and other bad effects, just as too little lubrication will do. Many motors have ball bearings arranged for greasing with a pressure gun. The following procedure has been used with excellent results for such motors. Preferably, motors should be greased while they are in operation.

1. Make sure that no dirt gets into the bearing with the grease, wipe the pressure-gun fitting, bearing housing, and relief plug clean.
2. Always remove the relief plug from the bottom of the bearing before using the grease gun. This prevents putting excessive pressure inside of the bearing housing, which might rupture the bearing seals.
3. With a clean screw driver, or similar tool, free the relief hole of any hardened grease, so that any excess grease will run freely from the bearing.
4. With the motor running, add grease with a hand-operated pressure gun until it begins to flow from the relief hole. This tends to purge the housing of old grease. If it should prove dangerous to lubricate the motor while running, follow this procedure with the motor at standstill.
5. Allow the motor to run long enough after adding the grease to permit the rotating parts of the bearing to expel all excess grease. This is very important.
6. Replace the relief plug and wipe the outside housing clean.

Totally enclosed, fan-cooled motors can be greased in much the same manner as that already described above, however, a modified procedure is required for lubricating the fan end bearing. By using this method it is unnecessary to remove the fan cover and fan.

*Excerpts taken from *How to Maintain Electrical Equipment*—General Electric Co. and—*Ball Bearing Practices for the Shop Man*—Marlin-Rockwell Co.

At the fan end the housing is provided with a vertical pipe, the outer end of which has a standard pressure-gun fitting, to permit the insertion of grease into the housing from outside the fan cover. On the horizontal center line of the motor, the housing is equipped with a removable pressure-relief or excess-grease pipe extending horizontally to the outside of the fan casing.

Again, for the most effective results in greasing the fan-end bearing, the motor should be in operation. The procedure is as follows:

1. Remove the horizontal excess-grease pipe. Using a screwdriver, wire, or similar implement, clean out any old hardened grease that is in the pipe.

2. Replace this pipe, and with a pressure gun add grease to the housing through the vertical pipe.

3. One or more times during the greasing process, remove and inspect the horizontal pipe. When grease appears at the inner end of the pipe, no more should be added. The pipe should then be cleaned of grease and replaced. This excess-grease pipe will now serve as a sump to allow further displacement of expansion of the grease that is in the housing.

Greasing Where Not So Equipped

A motor which is not equipped with the pressure-gun fitting and relief plug on the bearing housing cannot be greased by the procedures previously described.

Under average operating conditions, the grease with which the bearing housings of motors are packed before leaving the factory is sufficient to last approximately one year. At the end of this first year's service and about once a year thereafter the old grease should be removed and the bearings supplied with new grease. This will require disassembly of the bearing housings and a thorough cleaning of the housings, bearing caps and the bearings.

After cleaning and re-assembly, the bearing housing should be flushed out with a light engine oil before repacking with grease. Housings should preferably be filled not over one-third to one-half full. More than this has a tendency to churn and generate heat due to internal friction.

Best Lubrication Is None Too Good

The life of a bearing depends upon the load and upon the number of revolutions that the bearing turns. The thing which wears out the bearing is metal fatigue. Each time a steel ball rolls by a given point on the face, the metal is deformed or worked, and produces the same result as when you bend a piece of wire. The number of times that a ball goes by a given point is analogous to the number of times that you can bend a piece of wire. The heavier load on a ball bearing, the deeper a ball presses into the metal which is analogous to the distance that you bend the wire. If you bend a wire far enough and often enough, the metal will fatigue and the wire will break.

This factor controls the life expectancy of a ball bearing. Its useful life is rated at a given load, at a given speed, for a given length of time. Speed × time gives the number of revolutions that a bearing endures in the course of its life. Consider a four-pole, 1,800-r.p.m. motor which is running 24 hours a day, ten months a year. This motor will turn 777,600,000 revolutions in one year. If an automobile wheel were to turn at this same speed, its rate of travel would be 150 m.p.h., and in the course of a year it would have traveled 1,080,000 miles. Figures of this kind prove the statement that, "The best lubrication is none too good."

● International Lighting Exposition is to be held in Chicago April 19-23, 1945, at Palmer House Hotel. In it will be displayed newest developments and designs for future manufacture of lighting equipment for home, school, store, office, industrial plant, and for street and highway lighting. It will preview lighting equipment planned for after the war. Called international, it will have exhibitors from Canada and Latin America. Lighting conferences will also be held. Exhibits are expected from the Illuminating Engineering Society and Better Light-Better Sight Bureau, both of an educational nature. The show is sponsored by the industrial and commercial lighting equipment section of the National Electrical Manufacturers Assn. C. W. McDaniel, of Fostoria, soon to become associated with New-Mac Co. of Oakland, is the chairman.

● Manual of Better Home Wiring has been issued by the better homes department of Westinghouse Electric & Mfg. Co., Pittsburgh, as another step in its program initiated with the professional edition of *Electrical Living in 194x*. It sets forth simply the wiring it specifies to "wire ahead for better living." Its minimum wiring recommendations follow the previous manual but go into detail. No. 14 wire is not recommended. Part I contains the minimum wiring requirements recommended. Part II gives suggested specifications for single-family dwellings, with notes to the specification writer giving references to technical data sheets in *Electrical Living in 194x*.

Labor Percentage

Labor cost in comparison to other costs, has been on the increase. Not long ago George Abbett, president, San Francisco Electrical Contractors Assn., urged members to make analyses of present labor costs as compared to former in order to protect themselves in competitive bidding. He declared that rough checks had indicated at least a 50% increase in labor cost for the same job.

Of interest, therefore, to contractors and motor shops are the following percentages cited to the editor of *Electrical World* by Frank Boyd, president, Pacific Electric Motor Co. of Oakland, large and efficiently managed industrial electrical contracting firm.

Material	33.7%
Labor	38.2
Salaries	11.2
All other overhead	6.4
Taxes	9.0
Net profit	1.5
Total	100.0%

He went on further to explain that material cost also contains about 1/3 labor, and thus brings the proportion of labor cost to total billed price nearly 50% of every dollar a contractor receives.

Reasons given by other contractors for low labor efficiency are that few of the total expanded number of so-called journeymen electricians are really skilled, that almost no helpers or apprentices are available, and that transportation, housing and other war difficulties eat up valuable time in non-productive labor cost.

● Tornado in a Box, a moving picture depicting the operation of the gas turbine, was shown to groups in the West as a preview by the Allis-Chalmers Mfg. Co. through its local representatives. By means of animated drawings, the principles applying and the steps employed to develop the maximum efficiency of the turbine were graphically shown. It also indicated that further improvements will depend upon research into metals that will withstand the high operating temperatures. It is a 16-mm. film and is to be available on loan through the Allis-Chalmers representatives for use by schools, luncheon and professional groups.

● Inspection of 2,000 electric signs is going on in Vancouver, B. C., by the staff of the city electrical department. About one-tenth of the total had been inspected last month, revealing that of the 275, 66 needed repairs, 28 painting, 15 were condemned as unsafe and 81 had been unlawfully installed.

Sky is Limit in Farm Electrification

*B. D. Moses**

University of California

Davis.

THERE are two ways to use electricity on the farm—one is in the home and the other is in the production of agricultural products. So far as the domestic uses are concerned, they differ from those found in the city chiefly in size and capacity of units. There is more cooking and more laundering, and more preserving and more processing of foods. In some ways the farmer's wife leads her city sister in the use of electricity; for example, many farmers are freezing their produce and storing it in sub-zero boxes, and many do their own minor repairing. On the production side, such things as electric brooders and incubators, milking machines, electric motors and irrigation pumps have become standard equipment.

Practically all of the commercially handled poultry of today has been hatched and raised by mechanical hens, many of which use electric heat and more should. Incubators vary in size from fifty-egg capacity to several thousand, and the brooders, from a dozen chicks to a thousand. In the so-called "battery brooder" we find chicks crowded into box-like apartments, furnished with artificial heat, light and ventilation.

Before the war there were approximately 700,000 cows being milked in California, and it has been estimated by one authority that half of these are milked by machine, of which there are between 15,000 and 20,000 in use.

It hardly seems necessary to say anything about the irrigation motor because it is so generally known, but without doubt it has been the chief factor in the rural electrification development in California. In a recent survey made by Prof. H. B. Walker, he shows that on 588 farms studied there were 444 refrigerators, 403 irrigation motors and 380 washing machines. In other words, for every washing machine found on the farm there are 1.1 irrigation motors, and there are .9 as many pumps as there are refrigerators.

Many other ordinary uses could be listed but instead let us consider what might be called the unusual ones.

A poultryman in southern California experimented with his chickens by cutting off a portion of the upper beak, to prevent cannibalism and feather picking. It worked so satisfactorily that "debeaking" has become a rather common practice among poultrymen. The debeaker consists of an electrically heated knife that cuts off the beak and cauterizes the wound all in one operation. An expert operator can debeak 200 to 400 birds an hour, if some one hands them to him.

We are hearing a great deal these days about dehydration and the question is often asked why electric heat is not used. Well, there are instances where it is used, and successfully at that. Of course it has to compete with the oil and gas fuels but, in the processing of high-priced commodities, the price differential may be outweighed by the advantages gained by having accurate and positive controls. There are several walnut dehydrators that use electric heat successfully and there is room for more. The cost is not much of a factor, either, in the small household type of drier. Even after the emergency we are going to have drying in the farm home.

In 1940 there were 485,518,630 gal. of milk produced in California. Suppose that one fourth of this is pasteurized, it means that there would be a potential load of 50,000 kwh. per day to operate electrically heated pasteurizers. Some day the electric pasteurizer will be as popular as the bottling machine.

Now let us leave these practices that have been and are being used successfully and look a little into the field of what may seem more or less impractical or impossible.

It seems that, if eggs can be sterilized, they can be stored for a comparatively long time at a moderately high temperature without losing quality. But the difficulty lies in heating entire interior without getting some portion of the egg too hot. The thought was recently presented that inductive or electronic heating may produce the desired results, so we are going to get a high-frequency generator and see what happens when the egg is placed in its field. One thing we feel sure about and that is that the heating will be from the inside outward, but as to whether the albumen will heat faster, or whether the yolk will, we don't know. If it works we may find it possible to store eggs at ordinary refrigerator temperatures for a comparatively long time.

One of the most troublesome jobs on the poultry farm is that of cleaning the houses. Brooms, brushes, shovels and scrapers are resorted to now and the dirty litter is shoveled out a window into the alley, carried through the house in a carrier or wheelbarrow, or otherwise disposed of. Why not use a vacuum cleaner? Well it is being used successfully on one of the larger hatcheries of the state, but it is a very large and expensive installation. The wind pipes run from the various poultry houses to a central pump and cyclone several hundred feet away, and a 50-hp. motor is used to drive the blower. What I would like to see is a unit that could be driven by a 2- or 3- or even 5-hp. motor for cleaning one room at a time. Some day vacuum cleaners may be standard poultry house equipment.

Have you ever been in a poultry house on a hot summer day and seen the chickens walking around with their wings spread and mouths open panting for breath? Well this happens to millions of birds every year and the mortality from overheating is high. When we humans have this to contend with, we either go where it is cool or air-condition the room, but the poor chickens have no such relief; they have to stay put. Then it seems up to us to provide some relief for them. This we have been trying out and several years' experiments with poultry house cooling in the hot interior valleys point to the practicability and profitability of cooling poultry houses. This may go so far as to result in new designs for poultry houses equipped with automatically controlled heating, cooling, ventilating and lighting systems. Fantastic? Well maybe not so bad as one might think at first. One poultryman who turns out fryers for the San Francisco restaurants is seriously considering thermostatic and humidity controlled dampers for the rooms where he has 15 to 20,000 birds in battery brooders.

There are two kinds of chicken eggs on the market, the fertile and the infertile. The fertile are used for hatching and we hope that we always get the infertile for eating. There are two kinds of business in the chicken raising, one produces eggs for hatching and the other for eating, but so far turkey eggs are produced for hatching purposes only. So it is important that the turkey hen lays lots of eggs and that they are fertile. Some experiments that have been under way recently indicate that by the proper use of light the egg production can practically be doubled over that where no lights are used. Other experiments show that the use of lights on the turkey Toms hastens their maturity, thereby providing earlier mating.

Air conditioning is here to stay and we "could not if we would and should

* From an address before the Fall Conclave, Pacific Coast Electrical Assn., San Francisco.

not if we could" stop its progress. Here are a few things to think about.

Why not so insulate our farm houses and control ventilation that the loss of heat would be so low that the use of electric heat would be economical?

Why not make use of panel heating, so that the walls and ceiling could shine heat on us from all sides and keep us warm even in a cool atmosphere?

Why not make the whole thing, temperature, air exchange, humidity, light, automatic?

Wonderful things are being done in large buildings and large auditoriums. These same principles can and should be applied to the farm home and even to animal shelters.

The annual loss of grain from insects runs into the millions of dollars, and there is a continual quest for a simple, positive method to sterilize stored grain. Heating is practiced, and bins and warehouses are fumigated, but I feel that the job could be done electrically. It is easy to visualize a belt conveyor carrying a continuous stream of grain under radiant lamps or through a high-frequency field in such a manner as to sterilize each individual kernel, but not so easy to get the machine to do the job. It is entirely within the realm of possibility to have such a continuous process operating in our bins both large and small, both on the farm and in the mill.

There are approximately 95,000 tractors on the farms of California and 15 hp. is a very conservative estimate of the average size. This means that there is at least 1,425,000 hp. connected load that should be electrified that at the present time uses exactly zero kwh. The big stumbling block is transmission. What I would like to see would be a storage battery that would weigh 10 lb. per horsepower, would have a 20-hour operation per charge, could be fully recharged in 10 hours or faster, that would develop 110 volts, would be rugged, non-freezing and non-spillable.

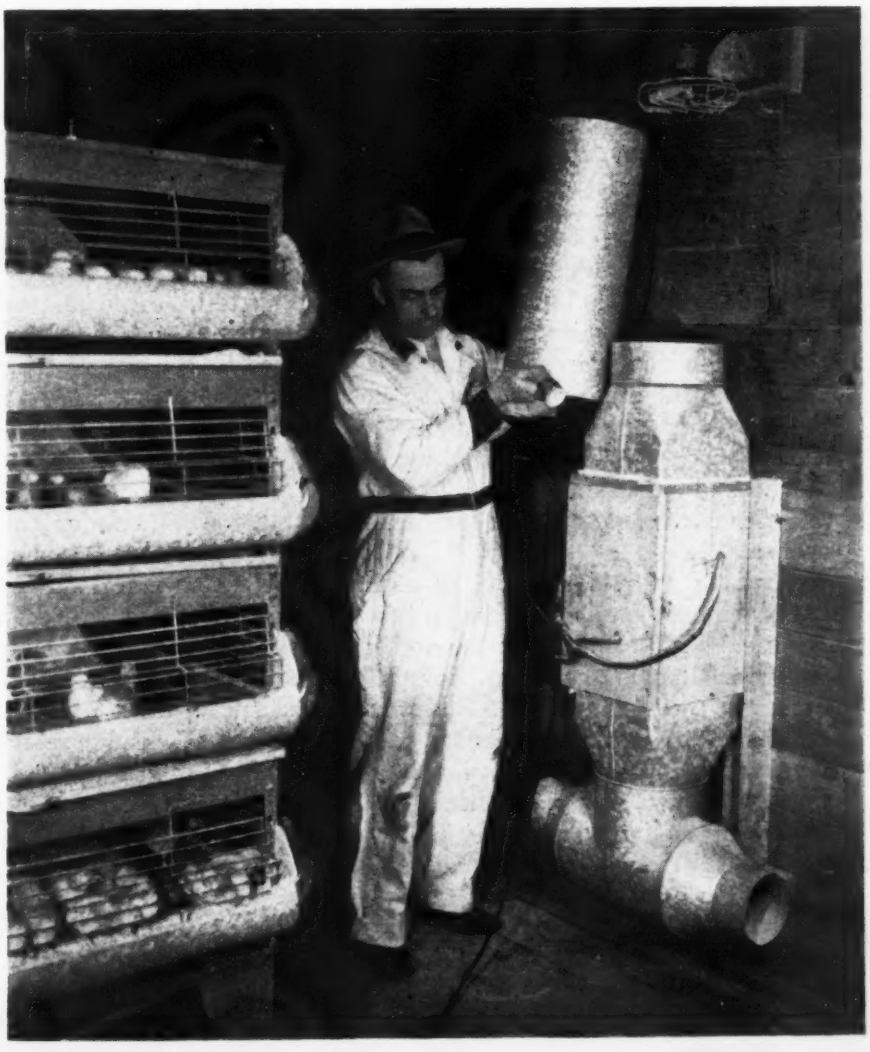
Utensil washing and sterilizing is being done satisfactorily on dairy farms but there is lots of room for improvement. Why not have a system similar to the completely automatic washing machines? A machine consisting of some kind of container or cabinet into which could be placed all the utensils used in the milking and milk handling process which would be automatically controlled so that the buckets, strainers, milking machine parts would come out clean and sterilized.

There are lots of other farm operations that may be listed that are fine things to think about and some electrical adaptations of them are coming:

1. An electric hoe.
2. A clamp-on type of water heater for heating the dairy wash water.
3. The use of ultraviolet light for sterilization of food products.
4. The development of an electrically heated knife for cutting the wax off honey combs. This is a necessary operation in extracting honey.
5. A thermostatically heated boiler for heating honey for straining.
6. A satisfactory blower for protecting certain truck crops against spring frost.
7. A system of drying paint on the walls and ceiling of a building, using infrared lamps.
8. Humidity control for incubators.
9. Self-cleaning droppings boards for poultry houses.
10. A high-frequency surgical knife for animal surgery.
11. A simple process for drying hay in the stack or in the barn. This is already being done in some of the midwestern and eastern states.
12. Inductive and electronic heating for dehydration.
13. Use of the photo-sensitive cell for assorting and grading agricultural products.
14. The use of electric lights in the inspection, grading, and assorting of agricultural products. Much progress has already been made and there are some packing houses and some inspection booths that have installed suitable lamps much to the benefit of the packing industry in the interests of the farmer.

California leads the country in its rural electrification as is shown by the statistics compiled by the Edison Institute. On Dec. 31, 1943, 127,812 farms out of 132,658 or 96.3% had electric service. This is due greatly to the attention that the power companies have given to the farm load. The efficient staffs of farm power advisors have rendered an invaluable service to agriculture. However, we mustn't feel self-satisfied and think that the business has gotten to a place where it can take care of itself.

This forced-air type of electric heating unit for battery brooder houses has been developed in the Pacific Northwest. Heating element is located in the center of the device. The fan is at the top; outlets for the heated air at the bottom



ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
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Resolution for 1945

WAR is grim and tough and costly. The closing weeks of 1944 forcibly brought this reality home to Americans. Thus it is that the nation begins a fourth year of war with contriteness and determination, rather than with complacency and cocksureness. Rosy dreams of early victory and speedy return to the normalities of living evaporated in the grim realization that wars are not won by wishful thinking, but with the "blood and sweat and tears" of millions of young Americans who must face a fanatical and ruthless enemy.

Realistic appreciation of the costliness of the catastrophes of war may be a good thing for America. People may take the wartime restraints and restrictions as goads to spur their determination to help end the conflict. That would be a good thing in these days of lagging war bond sales, lagging production and lagging blood donations. Perhaps it will arouse in them the same hot intensity of feeling that makes G.I. Joe work and fight to end the war quickly and completely.

Maybe we people in the electrical industry can make, with G.I. Joe, a joint resolution to guide us in 1945. It should read something like this:

"We, Joe, like you, want victory—and peace. We, like you, want to resume our normal way of living—with a job of our own choosing, and a home and an opportunity to make our lives fit into the American pattern of initiative and enterprise. The war has interrupted your plans and ours; we must make sure that it does not handicap our future. When you return home, we don't expect you to be penalized for taking time out to defend your country. If you are making sacrifices to insure victory on the war front, then we will make sacrifices on the home front to insure that these years shall not be lost years—for us, for you and for future generations of Americans."

Contractors Selling Job

WHILE their national association is holding up to view the potential business for contractors from REA line construction, in the highly electrified West it is to another market that the contractors would do well to point. That market is the one of construction work for the electric utilities. Oldtimers among contractors may say that they have never had much business from the utilities and discount such opportunities.

The point they should not miss is that there is a selling job for them to do with utility managements. Running a construction department is not what it used to be. If contractors will analyze what they have to offer and make a sales presentation on that basis, there is reason to believe that much if not the major portion of utility construction in the future can go to private contract.

What is it that the contractor has to offer? Among his potential assets is that he can take over the difficult problem of providing, supervising and directing transient construction labor. The utility now has complicated labor situations of its own only made more difficult by temporary labor. The contractor's entire business is built upon the handling of that type of situation. Thus the contractor can offer to the utility construction work capably done at no overhead to the utility.

Under competitive conditions, no doubt many other economies can accrue to the utility. When the margin of operating cost to revenue narrows and requires economy, this may become more important to the utility.

Likewise, in competition with federally financed and tax free utilities, the private companies will need to reduce the cost of their capital expenditures in order to operate at higher over-all efficiency.

After the war utilities will need to rebuild much of their substation and transmission line facilities. If contractors can approach them with well thought out studies of comparative costs of such construction, and make an intelligent sales presentation to the utility managements, why can they not open up a new and wide field of business opportunity to themselves?

Praise for the CREA

IN CONTRAST to the lid rattling caused by REA letting off steam over its postwar promises is the solid satisfaction which the Far Western farmer can get out of the benefits he has enjoyed from many years of real rural electrification. The degree of this contrast is emphasized by the fact that in 1944 the various Western state Committees on the Relation of Electricity to Agriculture celebrated their twentieth anniversaries. Examination of the records of these committees reveals the extent of rural electrification in this region, and the diversity of electrical applications which have been developed for profitable use of electric power by the farmer.

The record of the Washington CREA over its twenty years of progress shows 156 research undertakings and 35 published bulletins. The California, Utah, Oregon and Idaho committees all have records equally creditable. The subject matter runs the whole gamut of rural electrification and touches almost every single phase of farm operation. Tangible contributions have been made to poultry husbandry, dairying, stock raising, fruit and vegetable growing, as well as to farm life in general. In terms of man-hours of labor or dollars saved, or in dollars of additional income, the total of these contributions for the electrified farms of this area would represent almost unbelievable figures.

Without doubt the high degree of rural electrification in these Western states is due in no small measure to the work of these committees. Their efforts to make the use of electricity profitable to the farmer has raised the subject of rural electrification out of the social and political categories and into the economic. For that alone, the committees are entitled to high commendation.

Whistling in the Dark

"CAN the electric industry double its load per customer in the first five postwar years?" asks one of our gas industry contemporaries. Then it goes on to prove that any such contention is purely a hope and a myth which fails to include sound statistical reasoning. It does admit that "there may be isolated areas where such an increase in domestic electric use may be obtained, but the exception does not prove the rule."

Maybe so, but we think otherwise. Fact is that such an accomplishment has already been achieved by one Pacific Coast utility and plans for similar accomplishments have been drafted by half a dozen more. Could it be that the gas folks are whistling in the dark?

Seattle City Light made such a record in the years just preceding the war. With upwards of 90,000 domestic customers, this utility converted approximately 17,000 of these to an "all-electric" rate, basis of which was the installation of an electric range and an approved type water heater. Feature of the rate was a $5 monthly minimum. In the four years during which appliances were available, the average annual residential consumption for the system increased from 1,875 kwh. to 3,990 kwh.—more than double.

Probably the author of the gas article would call this the "isolated case." However, the feat is one which might be equaled by any other electric utility that wanted to set a similar rate and actively promote the sale of the appliances. Part of the Seattle utility's postwar planning is to sell 17,000 more customers on the all-electric rate in the first five years after the war. In the light of such evidence the gas folks can't dismiss lightly the goal of doubled domestic electric consumption in V plus five.

Small Business and Bureaucracy

WHILE so-called big business is hampered by the jungle of regulations and rulings of bureaus and boards, it is the medium and small business that suffers the most. It cannot afford the separate legal staff to match wits with the young theorists filling many of the administrations and boards who are long on words and short on practical reality. It cannot afford the clerical forces necessary to make out all the forms. In fact, the small business gets the squeeze in every way.

IMAGINATION sees through the mountain. Enterprise discovers the way over, around or under. Imagination paints the picture in the artist's mind. Enterprise finds the paints and talents to put it on canvas. Imagination designs a product that will help or serve or please people. Enterprise finds methods for producing it, improving it, making it available to more and more people. In a free country, imagination and enterprise succeed by useful, helpful service to people—by creating opportunities to help the individual improve his condition. Without freedom, imagination serves greed and hatred—enterprise turns to intrigue, enslavement and oppression. Freedom, imagination and enterprise built America—helped keep it a nation of free people—and gave us our reserve of power to fight tyranny. We all must guard this freedom constantly—so that imagination can continue to envision benefits for all of us, and enterprise can make them real.—From an advertisement of the Chrysler Corporation.

Chapter Change

Paul Geary of NECA studies northern California area

Paul Geary, assistant general manager, National Electrical Contractors Assn., from Washington, D. C., spent considerable time in California during December, consulting with the chapters in that state and endeavoring to work out a formula for the area chapter, Northern California Chapter. Previous to meetings in San Francisco with the board of directors of the latter, he visited the Los Angeles Chapter, the San Diego Chapter and met with groups in Bakersfield, Fresno, Sacramento, Oakland and San Francisco.

In a down-to-earth talk to each group, he pointed out that the electrical contractors' business depends on three factors—1. How much business there is that it is possible to obtain, 2. The type of business practices of competition and 3. The contractor's own ability, and that of his organization, to secure business in a competitive market. The latter is the only factor over which the contractor has any control as an individual.

It is to assist the contractor on the first two that the national trade association is needed, he declared. All the factors that affect contracting are both local and national in their influence. he said. These include government regulations, labor, materials, codes, and even competition. Strength of contractors to cope with these, both locally and nationally, comes from a national association and local chapters operating on the same constructive policies, Geary explained.

NECA is endeavoring, Geary said, to cover the entire country with chapter areas. In that way the work that electrical contractors should do can be developed and the competitive problems of the future can be guided along reasonable lines, instead of sinking to destructive levels.

Geary spoke of the need in the future to work out with labor some program of annual wages at rates that will permit electrical contractors to regain lost maintenance work so long as they can provide steady employment.

When Paul Geary, assistant general manager, NECA, Washington, D.C., met with the Sacramento Electrical Contractors and Dealers Assn., he was introduced by a long-time NECA member, J. D. O'Connor, of Lupen & Hawley Co., (standing). At the head table were W. J. Varley, western field representative, NECA, (left) and Paul Geary, (right). C. C. Buford is chairman

● EMEA of Southern California at its monthly dinner, Dec. 20, in lieu of a speaker, turned the evening over to the sponsoring and associate members, consisting of manufacturers, manufacturers' agents, jobbers and distributors, to display equipment, catalogues or data sheets. A few late developments were displayed but, due to lack of local stock, many items now in use in war plants were not available for demonstration. The electronics class, ordinarily held prior to the regular meeting, was postponed until January. New by-laws and constitution, made necessary by the incorporation of the organization, were read by President Julien H. Davis and were voted unanimously by all active members.—Henry Bush, editorial chairman.

Inspectors' Ordinance

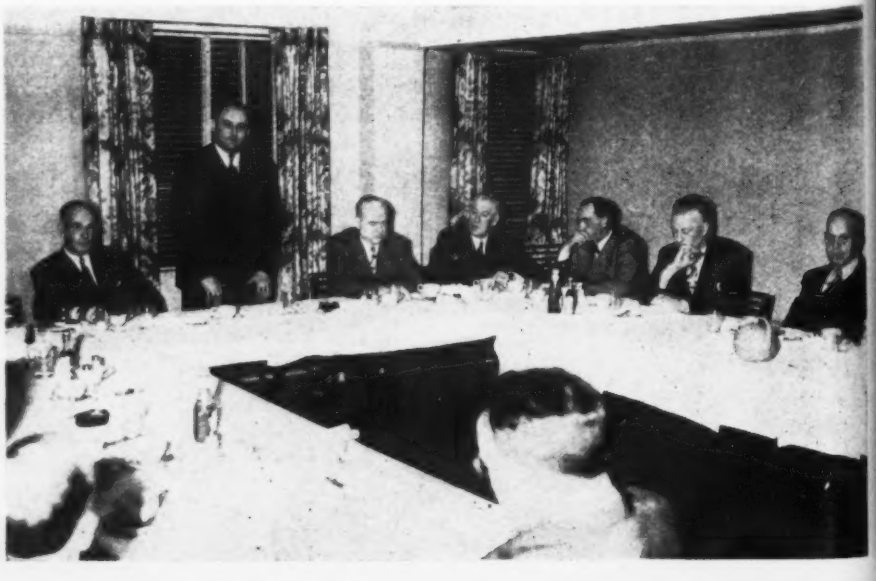
Reviving the idea that a uniform electrical inspection ordinance should come from the inspectors association, the Southern California Chapter, International Association of Electrical Inspectors, at its Nov. 29 meeting in Pasadena, appointed a committee to propose such a plan. The suggestion came from M. G. Riddle, chief electrical inspector, Pomona, who was then named by the newly elected chairman, Jesse Ross, city electrician, San Bernardino, to head a committee to work up such a program. Others appointed were I. E. Bartlett, city electrician, Inglewood, retiring chairman of the chapter (who presided during the morning session); E. W. Malmgreen, electrical inspector, Alhambra; R. W. Derby, electrical inspector, Upland and Paul Rodet, chief, Los Angeles department of electricity.

The meeting covered a variety of subjects, from accidental deaths to contractors registration and examination. Infrared lamps used too near circuit breakers radiated heat and tripped them, J. G. Moyen, Square D Co. reported. Hazardous and substandard appliances and lamps recently placed on the market were described and reasons for banning them were given. Fred Weber asked for suggestions from inspectors to assist Underwriters' Laboratories in changes contemplated in standards for electric fence controllers. Paul Rodet asked for more time to work, as a committee, on definitions of portable and fixed appliances and minimum length of supply cord for portables.

Next meeting will be held at Long Beach at the American Legion Hall, Jan. 31. On the program will be a talk on *Better Wiring for Better Living*, by Elbert Kramer, Westinghouse. L. C. Witt, electrical engineer, City of Glendale, spoke at the November meeting, discussing changes from 50- to 60-cycle frequencies. H. G. Ufer was re-elected secretary-treasurer and Jesse Ross, chairman, of the chapter.

● ELECTRIC CLUB of San Francisco, on Dec. 4, heard a modestly presented philosophy back of the General Electric Co. advertising from W. V. Merrihue, manager, apparatus advertising and sales promotion, Schenectady. Throughout that company's advertising, he explained, was a theme of promoting electrical living which had helped all other manufacturers in the industry. One of the points he made about the changed public attitude toward business today was that the public demanded not only a good product at reasonable price but that the business morality of it be above reproach.

● GREATER CENTRAL VALLEY Chapter, IAEI, held a meeting for the election of officers and for code discussion, Dec. 5.



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HEAR TED MALONE · MON. TUES. WED. EVENINGS, BLUE NETWORK

IES Activity

Washington Chapter, IES, plans a year ahead in which several of the major divisions of lighting are covered by programs presented by the most capable spokesman available for that subject, according to W. H. Creech, Graybar Electric Co., Seattle, chairman of the chapter. The first meeting will be Jan. 9, when Sam Williams, IES president, will be in Seattle. He will address three meetings, one of them the chapter, others of groups interested in illumination.

In February a school lighting meeting is being planned. Then during the remainder of the year programs on the following will be arranged: store lighting in the postwar, highway and street lighting, new equipment for postwar lighting, playground and playfield lighting, lighting for hazardous locations.

P. S. Linscott, Crouse Hinds Co., Seattle, is secretary of the chapter. During the past year a regional vice-president for the North Pacific Coast region has been named. He is C. T. Bakeman, Puget Sound Power & Light, Seattle, one of the chapter founders.

● Rocky Mountain Chapter, Illuminating Engineering Society, had an unusual subject at its Dec. 1 meeting, in Denver. Robert E. Glover, U. S. Department of the Interior, talked of visual acuity studies made on the eyes of spiders and other insects. On the chapter's program list for the new year is a meeting Jan. 18 with Sam Williams, IES president; Jan. 28 a lighting study forum and in February a talk on school lighting by Mr. Bradley.

● Southern California Section, IES, had to give up its projected trip to the Douglas Aircraft factory on account of security reasons, but heard on Dec. 6, at Hotel Alexandria, Los Angeles, William Davis, Douglas Aircraft Co., El Segundo plant, tell of *Solving Lighting Maintenance Problems in Aircraft Plants,* and saw hitherto unreleased sound movies of building of the plant and building of bombers. The study club met at 5:30 under Dr. Arthur Hoare as chairman. President's Night, honoring Sam Williams, IES president, is scheduled for Jan. 15. Williams is also scheduled to speak at Los Angeles Electric Club that noon.

● Northern California Section, IES, at its Nov. 29 meeting, San Francisco, heard the IES paper, *The Engineering of 24-Hour Daylight to Master Manpower Problems,* presented by John W. Millunchick, electrical engineer, Austin Co. It was profusely illustrated with slides showing a wide variety of difficult problems of structural size, substitute materials, blackout, and working under large wingspreads and bomber fuselages which were successfully solved. Chairman Robert L. Dearborn announced the committee organization of the section and outlined his hopes for technical projects to be undertaken by the section during his term of office. These include a project on nomenclature, another on short-cut methods of computation and a third on a study of surrounding conditions. The Jan. 13 meeting of the section will be that honoring IES President Sam Williams.

● Electrical Maintenance Engineers Assn. of Northern California, heard a thorough and easily understood description of induction heating as applied to hardening of metal surfaces. H. A. Messner, district engineer, Tocco division, Ohio Crankshaft Co., described the three means for obtaining high frequency for induction heating —spark gap, motor-generator frequency changer, and electronic—the relative costs and efficiencies of each. He then discussed the technique of applying the high frequency for control of depth of heat, the quenching and the various types of applications. The first of a new series of classes on "Electronics at Work" was presented by J. V. Kresser, engineering and service department, Westinghouse Electric & Mfg. Co. The meeting was held Dec. 7, in San Francisco, John Hayes, presiding.

● AIEE, in Sacramento, held a meeting Dec. 8, at which W. J. Delehanty, cable specialist, General Electric Co., San Francisco, discussed present-day wire and cable, answering questions following his presentation.

Two prominent electrical contractors from California who attended NECA conference at French Lick, recently, were Tom Drury, Bakersfield, and Ed Buttner, Scott-Buttner Co., Oakland

EEI Commercial Change

Reorganization of the commercial division of Edison Electric Institute, national utility organization, on a broad market development basis rather than an appliance application basis, has been announced by George W. Ousler, chairman of the commercial division general committee, of which R. E. Fisher, vice-president, Pacific Gas and Electric Co., is the Western member.

Under this plan all the activities of a particular market will be coordinated under the direction of one man. There will be four major sections, residential, commercial, industrial and rural, each directed by a vice-chairman. In each section will be several committees, such as in the residential section — lighting, electric kitchen, laundry, water heating, indoor climate, home service, dealer coordination and sales personnel.

In the commercial section will be committees on lighting, commercial cooking and baking, market development, motor application and sales personnel. In the industrial section will be committees on industrial lighting, general power and heating, competitive service and sales personnel. In the rural will be committees on service extension, farm utilization, equipment distribution and sales personnel.

Three special committees, independent of the major sections, have been set up also, all of them crossing the interests of each section. These are the commercial planning, basic sales training and wiring committees.

● Electric Club of Los Angeles had two electrical programs in December, sponsored by first General Electric, then by Westinghouse. E. O. Shreve, vice-president, General Electric Co., Schenectady, an ex-Westerner, briefly addressed the Dec. 4 meeting, giving his views regarding war production, postwar changeovers, and his company's plans for Western factory expansion. After the war he predicted keener competition, lower profits. On Dec. 11, Westinghouse brought its Sunday morning radio program to the Electric Club, with songs by John Charles Thomas and Ken Darby and The Kings Men and stories by John Nesbit. This program turned away 50 more than the 220-seat capacity of the Biltmore dining room.

● Bauer & Black may be surgical suppliers, but J. B. Black was not Harry Bauer, nor were the pictures on page 78 of the December issue in the right places for the names, so perhaps the editors need first aid for such an aching head.

Highlights of Anaconda messages to the public

re: POSTWAR ELECTRICAL POSSIBILITIES

TIME

..."America's electrical future is limitless... with victory, expanded use of electric energy will affect everyone—industrialist, dealer, housewife—employment, prosperity, living."

BUSINESS WEEK

..."but this fact is all important: when you plan your electrical future, start with *wiring. Adequate* wiring will be essential to full utilization of tomorrow's electrical possibilities . . . and that applies to municipality or factory, business or home . . ."

NEWSWEEK

..."by all means, bring the power engineer from your local utility and your electrical contractor into your *advance* planning. *Unwired* planning will cost you a lot more than *planned* wiring!"

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NEWS of the industry

PEPCO REORGANIZATION PLAN HAS SEC APPROVAL

SEC approval of a reorganization plan for Portland Electric Power Co. was reported from Philadelphia in December. The plan was submitted last summer by Guaranty Trust Co., trustee for the company's 6% income bonds.

Under the plan, Pepco bondholders would receive 95% and prior preference stockholders 5% of the company's assets, which Guaranty set at $27,475,000. Approximately $26,158,000 is due bondholders, including nearly $10,000,000 in accrued interest. If Guaranty valuation is accepted, about $1,300,000 would remain for holders of prior preference stock, or a little less than 23% of par value of shares held.

Before final adoption, the plan must go before the Federal District Court in Oregon, where reorganization proceedings are pending under the Bankruptcy Act. Valuation hearings were before the court last month, with Pepco Independent Trustees contending that SEC valuation was below actual value.

Meanwhile Pepco and its subsidiary, Portland General Electric Co., have asked SEC to exempt from competitive bidding the proposed issuance of $42,000,000 in new securities by Portland General. The refinancing plan is expected to save $900,000 annually in interest and it was believed that it could be accomplished more rapidly through private negotiations.

Manpower Shortages Delay Colorado River Project

Serious manpower shortages definitely end any prospect that completion of the Colorado River-Big Thompson project will provide eastern-slope water for electric generating and irrigation purposes in 1945.

This prediction followed an announcement by J. D. Meyer, executive secretary of the Colorado WMC priority committee, that crews now lining the Adams tunnel (connecting link between eastern and western watersheds of Colorado) will be transferred to jobs considered more urgent. When the interruption occurred, J. D. Magoffin Construction Co. and Stiers Construction Co. were working toward each other from eastern and western portals of the Adams tunnel, lining the 13-mile bore with concrete.

Meyer, in a statement to the press, said the construction crews were interviewed for the purpose of recruiting for reclamation projects with a higher priority rating. Most of the men consulted were willing to accept new assignments, he said, and it appears that crews will be reduced to a skeleton maintenance staff.

The action followed a conference of U. S. Bureau of Reclamation officials with the Northern Colorado Conservancy district representatives (an organization set up to repay cost of the project's irrigation features); it seeks to recruit 150 to 200 workers from Adams tunnel workers.

The local WMC chief added that under no conditions could the Adams tunnel have been completed in 1945 unless some 200 more workers could be found to supplement those working for Magoffin and Stiers.

County Asks Judgment On Boulder Dam Revenues

Seeking a legal showdown in a long-standing controversy over the distribution of Boulder Dam revenues, Clark County, Nev., recently filed suit against its parent state demanding $1,246,300 and a declaratory judgment that would forever entitle it to share in the $300,000 which Nevada receives annually from the government.

The judgment is sought on the grounds that Clark County is entitled to share in the Boulder Dam receipts in order to compensate it for the taxes lost when the county gave the government the land for the dam.

The $1,246,300 demanded by the county represents a lion's share of the $1,560,000 which Nevada has received since first payments began in 1938. The case is expected to reach the state supreme court.

● LOW BID for construction of 43 miles of transmission line between Eugene and Drain, Ore., to carry Bonneville power to the Douglas County REA system, was made by the Tice Electric Co., Portland, on Nov. 28. Contract award, if approved by the Bonneville Administration and REA headquarters in Washington, will be on a bid of $121,416.

● CHICO, CALIF. city council last month voted to invite representatives of the USBR and Pacific Gas and Electric Co. to appear at public hearings on the question of municipal ownership of electric distribution facilities.

CITY STILL STUDYING POWER DISPOSAL PLANS

With its original plan for disposal of Hetch Hetchy power to two California irrigation districts unacceptable to the Interior Department and with an alternate proposal blocked by refusal of Pacific Gas and Electric Co. to "wheel" power to Navy installations, the City of San Francisco late last month still was trying to draft a plan which would conform with the Raker Act and save all or part of its $2,400,000 annual revenue from the power project. Federal Court injunction against sale to PG and E is effective March 1.

The plan sent to Washington in November and involving sale of the power to irrigation districts of Modesto and Turlock, Calif. (EWEST December, p. 84) was turned down by the Interior Department because it involved resale of power to PG and E.

Under an alternate plan, containing suggestions made by Interior Department officials, the city would have served the Navy yards at Mare Island and Hunter's Point, supplied municipal needs and sold the remainder of the power to the irrigation districts.

In refusing to transmit Hetch Hetchy power to the Navy yards, as proposed by Secretary Ickes, James B. Black, president of PG and E, stated that the company did not believe it should be asked to transmit power other than its own, if such power is to be sold to customers that it is able to supply.

A third plan being considered by the city last month involved a loss of $500,000 in revenues but was believed to be "at least a 79%" compliance with the Raker Act. Under its terms, the city would use 46% of the power, sell the irrigation districts 33% for immediate use and form a reserve of the remaining 21%, with the hope that the districts eventually could market it to industries.

● GROSS REVENUE of $50,000,000 for sale of more than 21,000,000,000 kwh. of electrical power generated at Bonneville and Grand Coulee plants during the past five years to December 1944, was announced recently by Bonneville Power Administrator Paul J. Raver. Net surplus amounted to $12,000,000 in five years after payment of power costs, operation and maintenance expenses, depreciation costs and interest on Bonneville-Grand Coulee power transmission grid and power facilities at the two plants.

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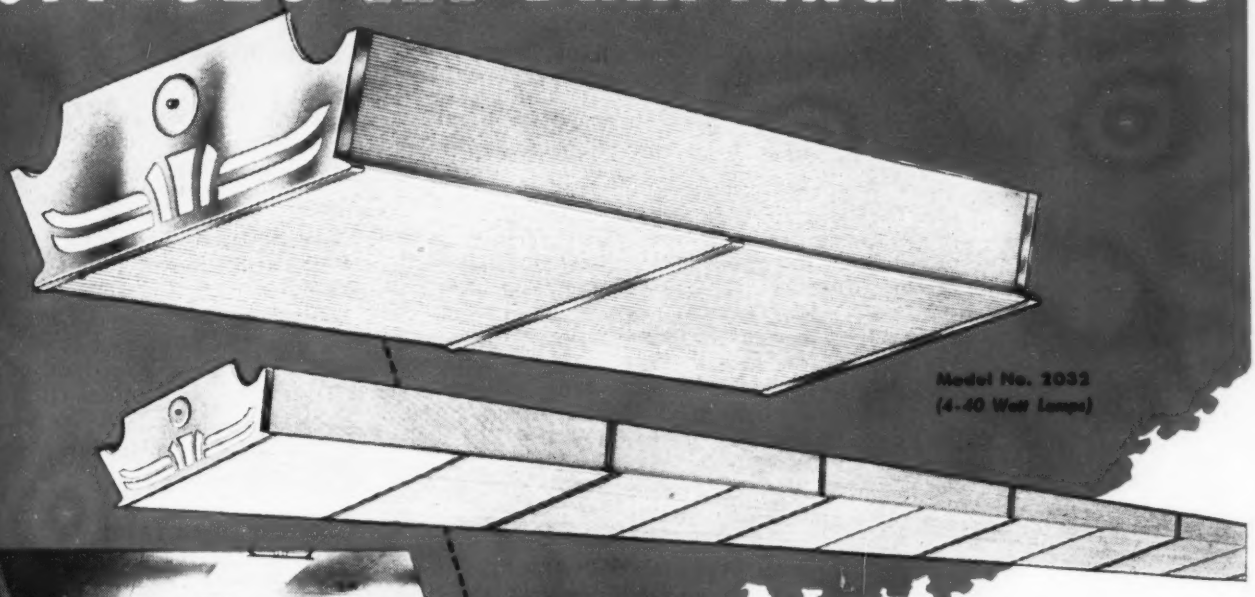

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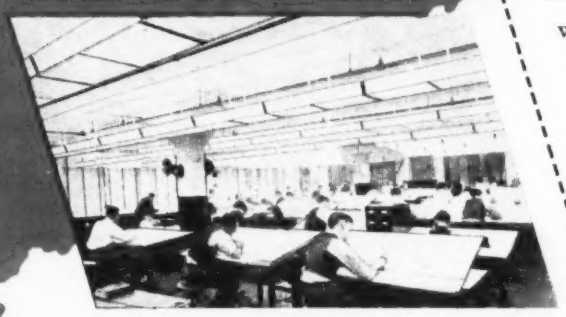

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ARIZONA COURT RULES IN UTILITY OWNERSHIP CASE

The Arizona Supreme Court recently handed down a decision that one incorporated city or town cannot purchase and operate utility plants within the corporate limits of another. The ruling affected the sale of Arizona General Utilities Co. properties and probably will have a bearing on the purchase of the Tucson Gas, Electric Light & Power Co. properties, for which both Tucson and the small municipality of South Tucson have been bidding.

Taxpayers of Safford asked the court to enjoin the Arizona General Utilities Co., subsidiary of Associated Electric Co., from selling its properties, 80% of which are located in Safford, to the adjoining municipality of Thatcher. The court prohibited the sale on grounds that Safford would lose its second largest property taxpayer, causing the town's tax rate to be increased, while, at the same time, Safford residents, through electric power charges, would be paying off Thatcher's bonded indebtedness for the utility.

In the Tucson case, taxpayers of South Tucson in January 1944 voted $9,500,000 in revenue bonds for purchase of electric utility facilities in the area. In an opposing action, the City of Tucson filed condemnation proceedings against the company, and city officials in August offered $9,000,000 for the properties. Tucson voters had turned down a purchase plan in an election held previous to the action of South Tucson. It was believed that, as a result of the high court's decision, the Tucson City Council might attempt to acquire the properties for a sum nearer its earlier estimate of $6,000,000.

Utah Traction Sale Is Approved by Commission

FPC approval was secured last month for acquisition by Utah Power & Light Co. of remaining facilities of its wholly owned subsidiary, Utah Light and Traction Co. Elimination of the traction company was undertaken by the utility as a step in simplification of its capital structure.

The commission also approved company proposals to make accounting adjustments involving elimination of $5,674,184 from plant accounts. This was in adjustment of an FPC order in 1943 calling for disposal of $25,973,720 by Utah Power and $1,916,077 by the traction company.

● SALE by Montana Power Co., Butte, of all securities of its subsidiary, Glacier Production Co., Butte, to the American Power & Light Co. of New York was approved recently by the Securities and Exchange Commission. American Power, parent company of Montana Power, will pay $9,900,000 for 6,000 shares of Glacier's common stock valued at $660,000 and for $3,690,000 principal amount of debentures. American Power also will give Montana Power title to Glacier's natural gas properties.

SEC Approves Utility Sale to Oregon Co-op

Sale by Oregon Gas and Electric Co. of its electric utility plant serving Columbia, Clatsop and Washington counties to West Oregon Electric Cooperative, Inc., for $130,000 was approved recently by the Securities and Exchange Commission.

Oregon Gas and Electric, subsidiary of Washington Gas and Electric Co., will liquidate and dissolve, while proceeds from the sale and other assets will be paid to Continental Bank & Trust Co. of New York for first lien and general mortgage bonds of the parent company.

Colorado Town Takes Over Electric System

The Estes Park, Colo., hydroelectric generating system and distribution lines went into service under municipal ownership Jan. 1, 1945, with a former reclamation service man, Leo F. C. Mallock, in charge as superintendent of power.

This area, formerly served by Public Service Co. of Colorado, was subject to the changeover as a result of a special election Sept. 11, 1944, in which property owners voted 108 to 1, for a $250,000 bond issue to finance the enterprise. It is understood that Public Service of Colorado agreed on $225,000 as a reasonable price for its several hydroelectric plants and distribution system, which serves only the village and a restricted area nearby. No new rates were announced.

Mallock previously was located in Guernsey, Wyo.

● RECENT REA allotments in the Western states include $250,000 to Douglas County PUD in Washington for 124 miles of line to serve 374 members. Included in the total is the acquisition and rehabilitation of 58 miles of existing line. Other allotments: $195,000 to the Valley County Electric Co-op in Montana; $25,000 to the Blachly Lane County Co-op in Oregon; $40,000 to the Chelan County Electric Co-op in Washington; $30,000 to the Central Valley Electric Co-op, New Mexico.

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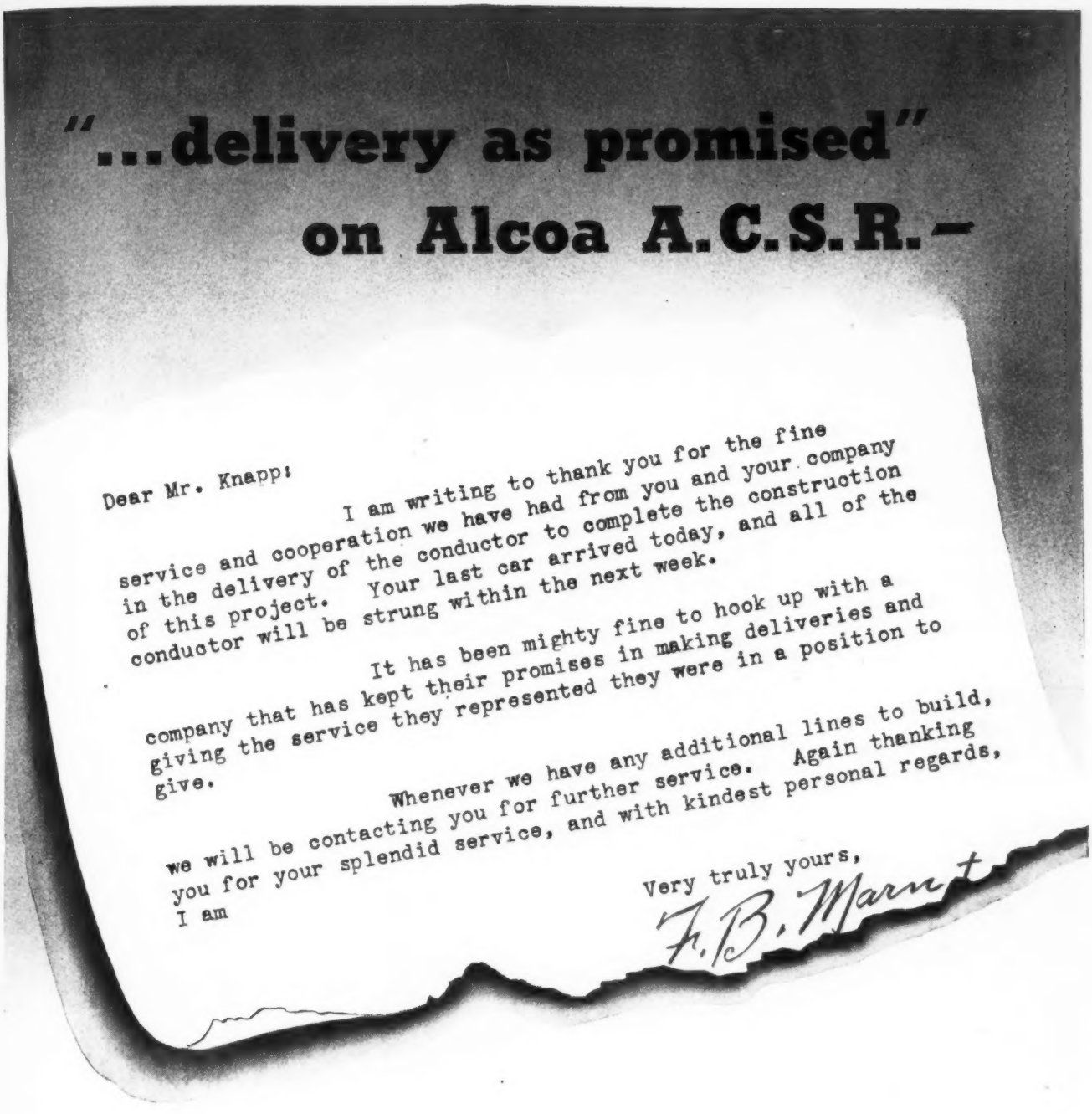
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I am
Very truly yours,
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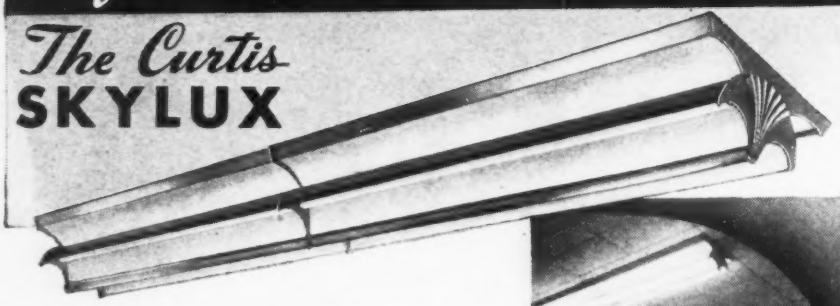

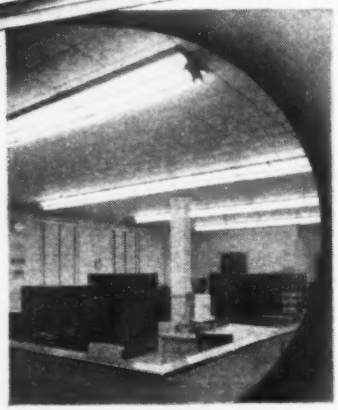

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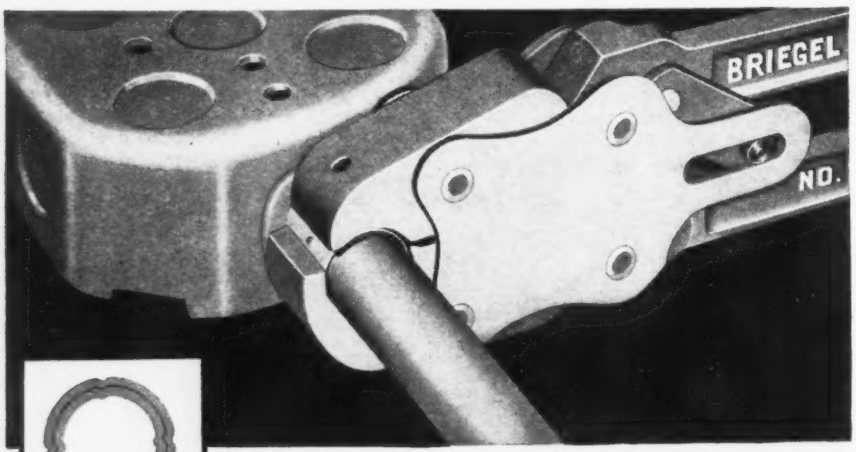

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POWER SHORTAGE FORECAST FOR ROCKY MOUNTAIN AREA

A shortage of electric power in Colorado, Wyoming, western Nebraska and northern New Mexico was forecast in a report just released by a committee headed by Francis L. Adams, Fort Worth, Texas, regional administrator for the Federal Power Commission. The report is one of a series by the business and social research bureau of Denver University, involving metropolitan Denver's postwar program. It was prepared by the project's power committee.

Prediction is made that demands for electricity in the states indicated will outstrip capacities of existing power plants within five years. It estimates, however, that potential power from proposed and potential multiple-purpose water projects can be generated to meet the growing demands.

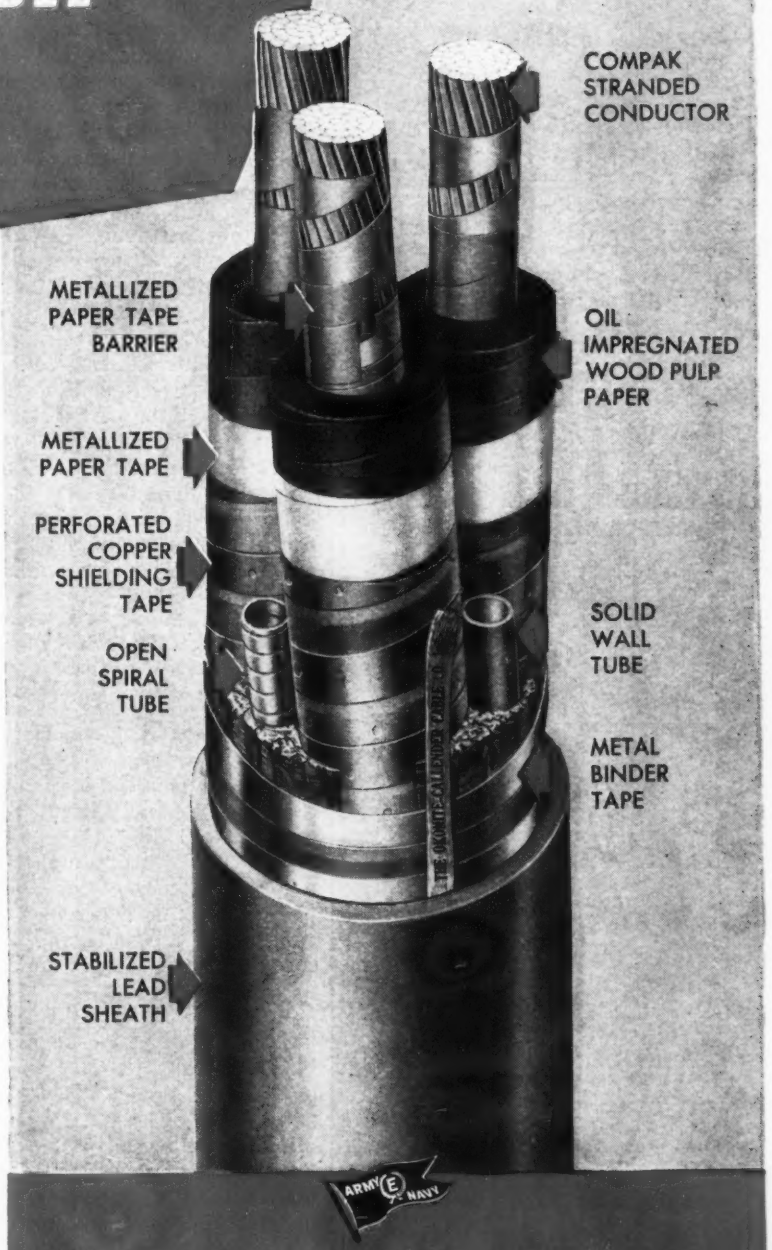
Purpose of the report was to examine the power situation in Colorado and Wyoming, with a view to finding answers to three important questions: What are the existing and possible power supplies to be derived from fuel and hydro generation? Is this supply adequate to meet present and long-range requirements? How can large amounts of electric power be used to best advantage as a driving force in the development of this area?

It is pointed out in the report that the Colorado-Big Thompson, Blue River-South Platte, Gunnison-Arkansas and Kendrick project, in Wyoming, can generate approximately 2,130 million kilowatt-hours of energy at minimum water levels; nearly 1,400 million kilowatt-hours more under conditions of average water supply. These figures are, respectively, 1.7 and 2.7 times the total energy consumption for this region in 1942. Nevertheless, the survey states, substantial amounts of fuel-electric generating sources may be needed to supplement new hydro systems, since conservative estimates predict a 40% increase in the region's power load in the next 15 years.

Utility men of the Rocky Mountain area said they were "puzzled" by the conclusions drawn; referred to plant capacity increases and improvements in anticipation of expected requirements, and reflected that government officials have predicted, on numerous occasions, power shortage for war production purposes (none of which materialized.)

● Puget Sound Power & Light Co. called for retirement on Dec. 1, more than $500,000 of its new 4¼% first mortgage bonds. The bonds were sold in April 1943 and did not mature until December 1972.

OKONITE-CALLENDER LOW GAS PRESSURE CABLE



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Okonite-Callender low gas pressure cable can be used wherever solid type cable would normally be installed for operation at 10-40 kv. It can be used to advantage where steep grades give rise to pressure problems with solid or oil-filled cables.

Advantages

- This design prevents development of excessive internal pressures such as occur in solid type cables under heavy load conditions.
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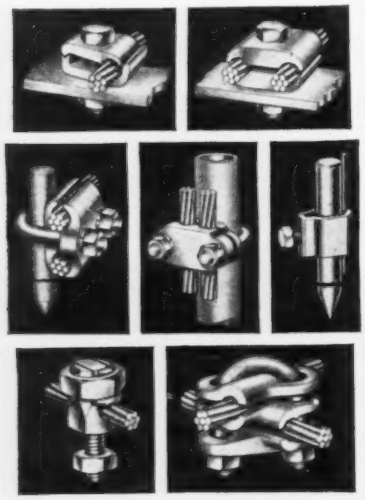

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LOS ANGELES PLANS POSTWAR EXTENSIONS

Ready to launch when fighting in Europe ends is a $124,344,500 program of improvements and extensions to the Los Angeles Department of Water and Power system, it was announced recently. Submitted to the Board of Water and Power Commissioners by General Manager Samuel B. Morris, the tentative program includes an engineering progress report indicating that $51,309,000 of projects can be started within one to twelve months after final approval.

Major portions of the program, designed to cover a period of seven to eight years, are power system projects which are estimated to cost $101,000,000. Work will include betterments and extensions of production, transmission, distribution, receiving station and tie line facilities—many of them jobs postponed because of wartime shortages, it was reported.

Included in the initial plans are a second unit at the Harbor steam plant in Wilmington; construction of a double-circuit 132,000-volt line connecting receiving stations B and D; erection of three new distribution stations; and extensions and betterments to the low-voltage overhead and underground system.

Each of the projects is subject to approval by the commissioners, as labor and materials become available.

Supreme Court Verdict Asked in PG and E Case

Contending that the utility is operated by West Coast people and that North American Co. does not dominate its policy, Pacific Gas and Electric Co. last month took to the United States Supreme Court its request to be termed not a subsidiary of the holding company. A lower court had upheld an SEC ruling that PG and E must be considered a subsidiary under the holding company act.

Counsel for the utility stated that, under the act, SEC is required, on application, to hold an operating company no subsidiary of a holding company which owns in excess of the 10% minimum allowed by the act, if the operating company can show that its policies and activities are not dominated by the holding company.

Counsel pointed out that North American has consistently decreased its holdings of PG and E stock from 19% some years ago to 17% when the matter was heard by SEC in 1941. North American holdings have been reduced since that time to 13% of PG and E stock by the issuance of company stock as dividends on North American securities. By Jan. 1, 1946, it was argued, North American's holdings of PG and E stock, originally obtained when the utility purchased a North American subsidiary, will be below the 10% minimum.

Counsel for SEC argued that the company had not borne the burden of proof that it was not controlled by North American.

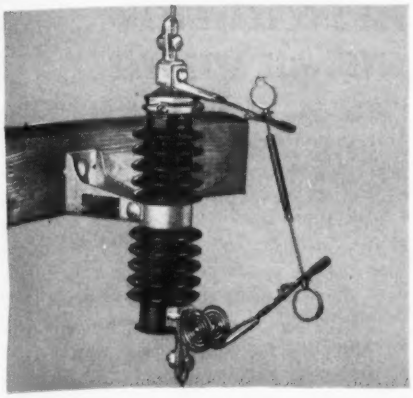
Speaker Urges Revision of Government Power Program

Revision of the government's power distribution program to enable private utilities to buy federal power and distribute it to industries at rates profitable to both, was advocated by Harlan I. Peyton, president of the Spokane Chamber of Commerce, at a recent meeting of the Northwest Mining Assn.

Peyton warned that the government's power distribution program, if not altered, virtually will prevent small operators from securing power to maintain peacetime production schedules. He pointed to the decisive role industrial power rates will play in future operations of the Pacific Northwest's light metals plants, and criticized Bonneville's sale of industrial power on a yearly basis only, as impractical for small operators.

● PERMISSION to continue construction of power line extensions in Lincoln, Linn and Benton counties, Oregon, has been granted the Rural Electrification Administration by the War Production Board following stop-work orders issued last summer, it was announced recently by Guy Thomas, head of the Lincoln-Benton cooperative in Corvallis. It is expected that 68 miles of line will be in service by March. Construction was stopped pending settlement of a dispute with Mountain States Power Co., Albany, Ore., which filed injunction proceedings on grounds it had made application to serve the area.

● ELECTRIFICATION of 3,900 eastern Washington farm homes through recent completion of 300 miles of distribution lines was announced late in November by V. P. Campbell, manager of the Inland Empire Rural Electrification Cooperative. At the same time, Campbell revealed plans for constructing an additional 125 miles of service extensions to serve 200 more farms in the area. The co-op receives its current from Bonneville, under an agreement with the Washington Water Power Co., and deliveries are made at Colfax and Opportunity substations.



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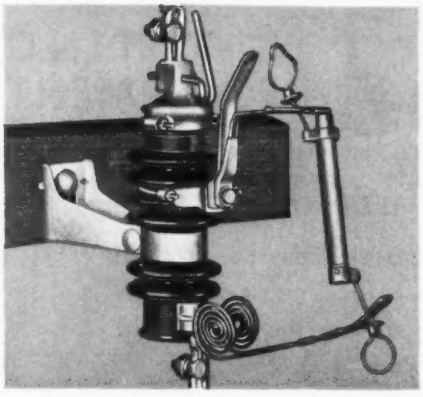
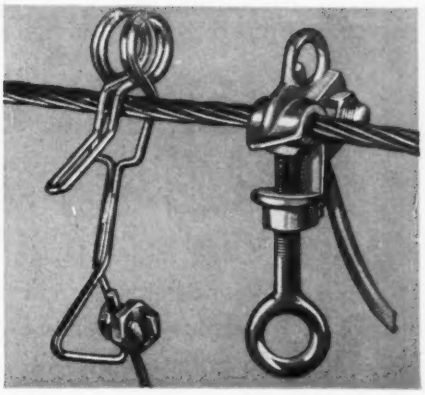


LIGHTNING STROKES dissipated through low resistance path to ground. Power follow-up interrupted within the horn fibre fuse tubes.



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PGE SICK LEAVE PLAN GIVEN WLB APPROVAL

The Twelfth Regional War Labor Board has approved a joint sick leave plan submitted by the Portland General Electric Co. and five AFL unions. "This plan can be regarded by companies and unions as a sort of unofficial guide in negotiations leading to voluntary applications," said George B. Noble, chairman of the regional board, in announcing board approval.

Major points in the plan, which affects nearly 1,000 employees, are: (1) A five-day waiting period is required before employee is eligible for benefits. (2) Medical evidence of disability must be provided on forms furnished by the company. (3) Sick benefits will be paid at straight time scale based on hourly work week. (4) Ten days' sick benefits in year will be permissible and shall be cumulative to a maximum of 25 days. (5) Employees with ten or more years of service shall be credited with one day's benefits for each year, with a maximum of 25.

Unions participating in the plan are: International Brotherhood of Electrical Workers, local No. 125; International Brotherhood of Operating Engineers, local No. 87; International Association of Machinists, local No. 1005; Automotive Garage and Service Station Employees, local No. 255, and Building Service Employees, local No. 49.

Veteran Re-employment Clarified by Ruling

Veterans of the present war will be allowed 90 days in which to claim the jobs they left to enter the armed services under an act signed last month, amending the National Selective Service and Training Act of 1940.

Under the original act, veterans were allowed 40 days in which to apply for jobs they held immediately prior to their entry into the armed services, whether through induction or by enlistment or by call in the case of National Guardsmen, reserve officers or members of the inactive reserve.

Under the law, employers who are able to do so are required to re-employ veterans in the same or in a similiar position to that which they left. The law has been interpreted by Selective Service officials to mean that veterans thus re-employed have a superseding claim on their jobs for one year.

● THE ELECTRIC HOUR, radio program sponsored by 160 electric light and power companies, has moved its schedule to Sunday, 1:30 p.m. PWT. It is heard over the CBS network from Hollywood and stars Nelson Eddy.

WHAT DOES AMERICA WANT?

IT IS THE PURPOSE of this editorial, the thirty-first of a series, to state the urgent need for a clear declaration of American policy in world affairs.

Within the past few weeks there has been a wakening conviction in this country that the determination of international arrangements cannot safely be put aside until victory has been won. For we have seen actions taken in Europe seemingly without full consultation and agreement of the Allied powers, which may profoundly affect the design of the post-war world.

A declaration of American policy is needed, and it should be accompanied by a statement of our firm intention to exert full effort to procure its acceptance and furtherance. Emphatically, this does not mean that an American platform should be put forth as an ultimatum, which other nations must accept totally, or reject at the cost of having the United States withdraw from collaborative participation in world agreements and organization. On the contrary, the first plank in such an American platform should be a firm commitment on our part to participate with our associate nations in building a general system of world security and order. By definition, this requires that each participant be willing to accommodate its purely national interests to a program that can be accepted as fairly representing the interests of all. But equally, there is imposed on each participant an obligation to state honestly and openly what it conceives its individual interest to be, as well as its concept of what measures will best serve the general interest.

☆ ☆ ☆

Americans have displayed a singular diffidence in the matter of formulating a bill of American objectives — singular, in that it contrasts so sharply with our power to exercise as broad a leadership as we are able to define. This reluctance stems partly from the inherent difficulty of arriving at a coherent statement of national aims in a country like the United States — so vast in area, so multiple in its sectional and group interests, and so soundly committed to the free expression of individual thought. But it stems also, in part, from a tradition of national isolation which, however understandable in historic perspective, now stands clearly discredited by two world wars which were not of our making, but from which we were unable to hold aloof.

That the economic wellbeing and political security of the rest of the world is closely bound to the decision and performance of the United States is questioned nowhere but in America. Political boundaries and restrictions cannot build effective fences against the interplay of economic forces, and the sheer weight of American economic influence is of crucial import to all the other nations of this globe. In large measure their decisions will be shaped either in response to the opportunities that our procedures offer them, or in defense of interests that our procedures may jeopardize.

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The United States contains only about 6 percent of the world's population. But — our national income, before the war, amounted to almost 25 percent of world income; our industrial output as a whole approximates 45 percent of world totals, and we now are producing a like percentage of the world's munitions; we have 35 percent of the world's railroad mileage; 25 percent of merchant fleet tonnage; 50 percent of the world's telephones; 45 percent of steel production; 40 percent of aluminum production; 33 percent of coal output; we are refining (though part of the production comes from imports) 55 percent of the world's copper, and 70 percent of its petroleum; we now are producing 50 percent of the world's rubber (though post-war resumption of natural rubber production will sharply reduce this balance); our shares of agricultural production are, of course, much smaller, but just before the war we accounted for 35 percent of world cotton production, 15 percent of wheat, and 10 percent of wool.

Whether we like it or not, we must exercise political responsibilities commensurate with the weight of our economic power in an inter-dependent world. But before responsibilities can be assumed, they must be defined. Can the United States arrive at a clear agreement and statement of aims for which it is willing to stand sponsor?

The recent campaigns of both political parties have helped to provide an encouraging answer. In general, election mandates are glaringly deficient as indicators of a unified national purpose. A majority of voters declare themselves for the winning candidate. But even among the majority there are varying degrees of enthusiasm for the platform principles espoused by their candidate; and the substantial minorities of the defeated parties may have had no enthusiasm whatsoever for particular planks in the winning platform, or for the platform in its entirety. A sportsmanlike deference to the will of the majority is a feeble substitute for unified national conviction.

But this Presidential campaign was noteworthy for certain basic principles upon which both the platforms and the candidates of the major political parties were

united. Surely, upon such areas of agreement there may be said to have been an American mandate; the more so, because upon certain of them, we have evidence that no party or candidate could have declared opposition with any hope of victory. What then were these agreed-upon principles? The following is an attempt at a fair summary:

1. That America, in collaboration with its Allies, is committed to seeing the war through to the unconditional surrender of our declared enemies.

2. That America is committed to a responsible role in a world security system after the war, including a commitment to lend the support of our armed forces to repel aggressions that may violate such security.

3. That America is committed to the post-war goal of substantially maintaining in this country an economy that will provide jobs for those who are able and willing to work.

4. That America is committed to the principle of achieving this goal of sustained, high-level employment of manpower and economic resources under a system primarily activated by competitive enterprise.

These are American mandates. They can be made the nucleus of a coherent national policy, for they define aims upon which the great majority of our people are emphatically agreed. But no one can pretend that in this generalized form they serve as more than directional guides for either internal legislation or international negotiation. This skeleton of aims must be clothed with the living flesh of agreed-upon means. Here we have no national mandates of comparable clarity, but it is patently clear that it is our compelling task to achieve them.

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On our elected representatives in government rests the primary responsibility for formulating the specific programs required to implement national policies. Under our system of government, those representatives need continuous nourishment in the form of mandates as to what the people want. Particularly during a period when so many urgent problems are being thrashed out upon an international basis, this imposes a grave responsibility upon all sectors of our citizens; for it requires them to think in terms of the welfare of our nation as a whole, to focus upon those points which offer possibilities for substantial agreement among Americans, rather than upon matters of individual, group, or sectional advantage.

In earlier editorials I have tried to define a basis for national policy in keeping with that broad purpose. They have dealt with problems that are basic to the healthy functioning of free enterprise under the competitive system, with the mobilization of our resources for war and for reconversion to peace-time production, with labor and management responsibilities and relations, with national debt and taxation, with foreign trade and our economic relationships abroad, with the industrial development of backward areas. Since they have been presented in the McGraw-Hill publications, which reach a group broadly representative of all American industry, they have centered upon problems that have an economic rather than a strictly political import.

Future editorials, to appear during 1945, will deal with comparable subjects selected in recognition of the urgent importance for arriving at concerted definitions of national policy. I am fully aware that no individual or group can speak authoritatively for the American Nation. But I hope that an honest attempt to formulate sound concepts of national interest in crucial economic matters will help to crystallize American policy both by focusing agreement and by eliciting dissent.

☆ ☆ ☆

Here there is space only to indicate in broadest outline what I conceive to be desirable foundations for an economic policy for the United States:

1. The attainment of a high and sustained level of business activity and employment in the United States and in the world.

2. Active and expanding markets for world trade based upon fair competition rather than upon bloc agreements, discriminatory preferences, and cartel arrangements.

3. The encouragement of industrial development in nations that have been backward in that respect.

4. A recognition that hospitality to imports, rather than constituting a threat to national standards of living, offers in fact the most potent instrument for international bargaining that any nation can command.

5. A willingness to assume a responsible national role in international arrangements designed to provide such financial stability as may be needed to support mutually advantageous world exchange of goods and services.

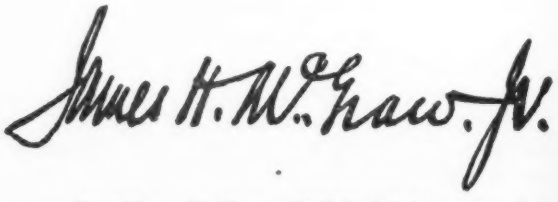
We must see to it that the end of military warfare does not merely open the door to an era of economic warfare.

The fact is that America has no choice but to assume leadership in world affairs. For the weight of our influence will be felt by other nations no less whether our attitude be positive or negative. And the cost to us of any international obligation which we might undertake must in all fairness be weighed against the equally real cost to us of dealing with measures that others may take to protect themselves against the results of our non-participation.

We have tended in the past to approach international commitments timidly, fearful that we might be outwitted in a world battle of wits. And in so doing, we have too often ceded to others the initiative of suggestion, leaving to ourselves the thankless task of accepting or rejecting what they demand of us.

Our one bargaining weakness stems from the fact that other nations, by contrast feeble in potential power, know what they want and are able to mobilize all their strength to achieve it.

America can be the most effective nation on earth—if only it knows what it wants.



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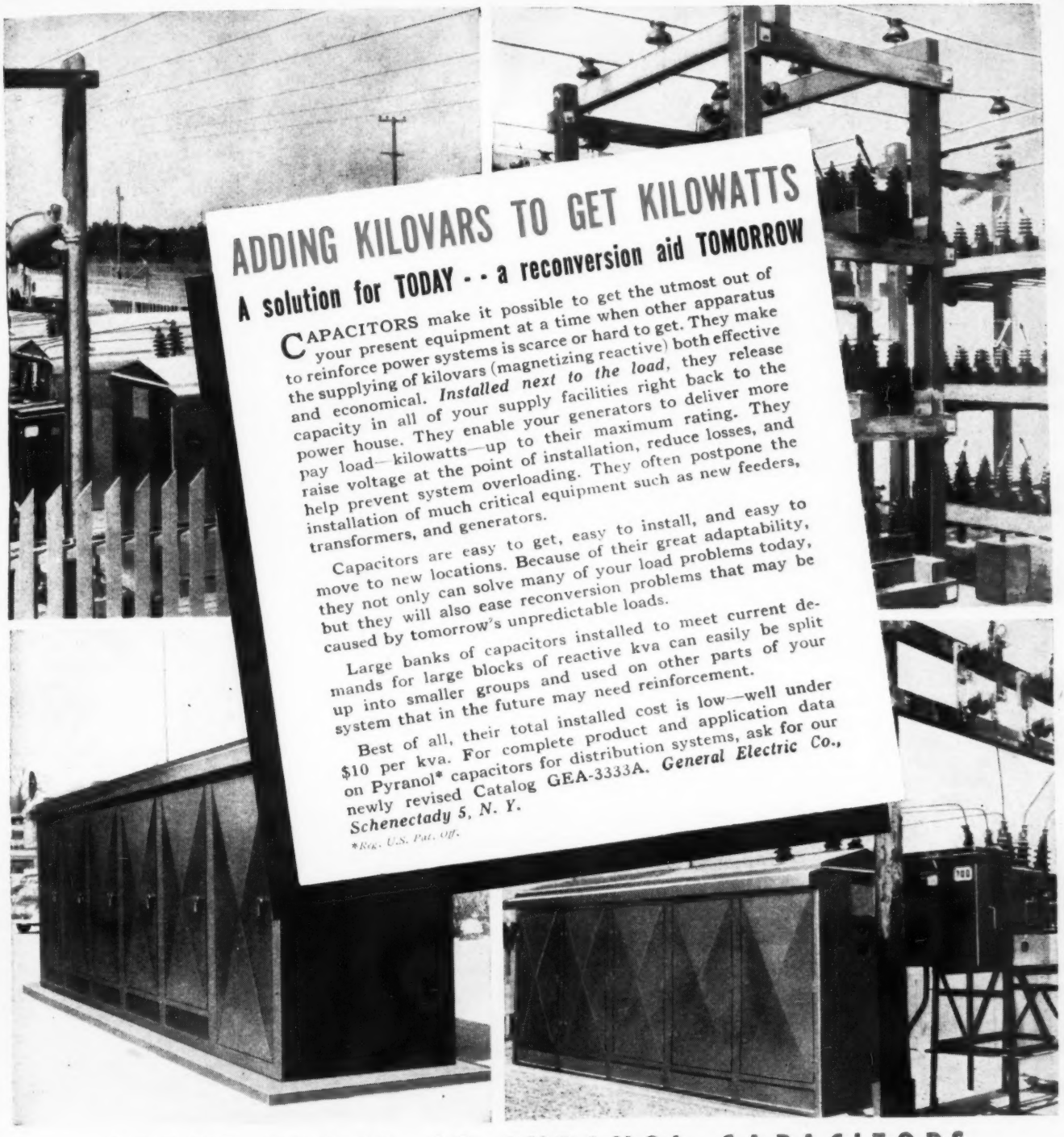

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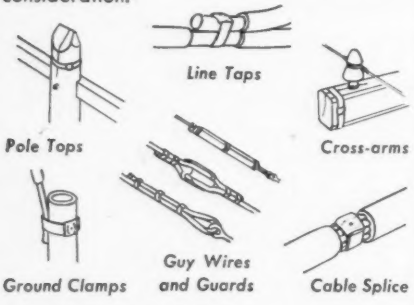

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DAM CONSTRUCTION ASKED BY IRRIGATION DISTRICT

Construction of two dams on the Fresno and Chowchilla rivers in central California by the U. S. Bureau of Reclamation, for development of water and power resources, and operation of the structures as part of the Central Valley Project was urged recently by the Madera, Calif., Irrigation District.

Purpose of the project would be to generate hydroelectric power, as well as to expand the irrigated acreage of the region and to store flood waters. Under plans outlined by the Madera district, water from the Fresno River would be stored during flood seasons and diverted into the Chowchilla River over a 1,000-ft. drop for power development.

Tentative Outlay Announced In REA Postwar Program

Under the proposed REA postwar construction program, a total of $49,555,000 would be spent in the eleven Western states and Alaska within three years after materials and manpower become available, according to tentative figures released recently. The national program contemplates expenditure of $579,000,000 over a five-year period.

Of the total allotted in the West, $34,850,000 would be for distribution lines to serve 87,600 customers and $14,705,000 would be to finance improvement of existing electric systems, construction of generation and transmission facilities and purchase by rural consumers of farm and home electric installations. Construction costs are based on prewar experience.

It is estimated by REA that, within five years after electric service is made available, farm customers receiving service for the first time will spend an average of $545 each for wiring and electric appliances, and non-farm customers receiving service for the first time will spend an average of $290 for wiring and appliances. Farm consumers now on rural lines will spend an average of $340 for additional appliances and wiring, according to the estimate, while non-farm customers now served on rural lines will spend an average of $175.

Tentative breakdown for the Western states is shown in the table.

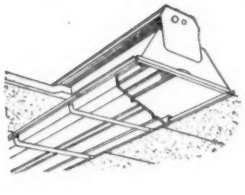
Taken at Shasta Dam Dec. 22 as the last bucket of concrete was poured, this picture shows Ralph Lowry (left), construction engineer, USBR, and Frank Crowe, general superintendent for Pacific Contractors, Inc., both of whom have been on the job since it was started in July 1940. The final pour was in the roadway deck, which will carry a highway across the crest of the 602-foot-high structure

● More than 1,283,000 acre-feet of water was impounded back of Shasta Dam, when USBR officials reported last month on storage in the lake. This was the greatest amount since storage began on Jan. 1, 1944.

REA Postwar Program—Western States

Area	Rural Customers to Receive Service	Total Man-Years of Labor Involved	Investment Required —For Program— Distribution Lines	Related Facilities
Arizona	5,200	1,000	$2,000,000	$ 100,000
California	3,700	800	1,500,000	750,000
Colorado	15,900	3,000	6,000,000	3,400,000
Idaho	5,100	1,000	2,000,000	1,950,000
Montana	10,300	2,000	4,000,000	1,100,000
Nevada	500	100	200,000	55,000
New Mexico	8,200	1,500	3,000,000	1,150,000
Oregon	13,300	2,500	5,000,000	2,000,000
Utah	2,500	400	750,000	800,000
Washington	12,200	3,000	6,000,000	1,750,000
Wyoming	9,800	2,000	4,000,000	1,300,000
Alaska	900	200	400,000	350,000

But *applications* unlimited as the architect's ingenuity!



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For the Engineer, exclusive Miller features such as continuous wireway channels (just like in the Miller Industrial 50 and 100 foot Candlers), patented brackets and other improvements make this the most practicable and economical lighting system with which to work.

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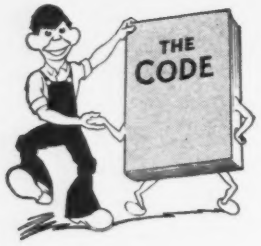

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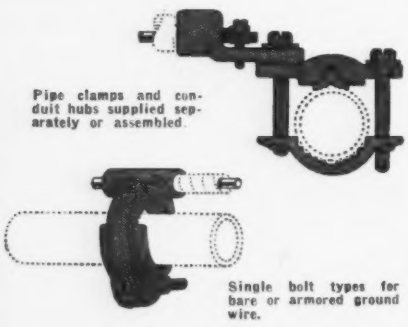

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PEOPLE
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Marquis Named Chief, OWU Power Division

V. M. Marquis has been named chief of the power division, Office of War Utilities to succeed Barclay J. Sickler. Sickler resigned Dec. 31 to return to Bonneville as chief of its division of power sales and service.

Marquis was graduated from Stanford University in 1921. took the G-E test course and received an M.S. degree at Union College. He was with General Electric until 1927. when he joined American Gas and Electric Co.

He came to the power branch of the old office of production management in 1942 to work on power supply problems. Later he was made chief of the Western regional unit of the power division's power supply section, in charge of power supply for the eleven Western states.

Sickler joined the old power branch of the Office of Production Management in September 1941. to organize its research and statistics branch. He assisted J. A. Krug. then chief of the power branch. Herbert S. Marks, later chief of the power division, and Edward Falck, OWU director, in organizing the energy-use curtailment program for the southeast. returning to BPA in November. The following February. he again went with WPB power division, this time as chief of its priorities section. In August, 1942. he became deputy director of the power division under Marks and, when OWU was organized in February, 1943. he was made power division director.

Westinghouse Supply Makes Matthews District Manager

Charles R. Matthews has been appointed manager of the Westinghouse Electric Supply Co.'s northern California district, succeeding E. J. Duggan, resigned, it was announced recently by David M. Salsbury, vice-president.

Matthews comes to his new post from Seattle, where he had been manager of the supply company's marine department since February 1943. Previously he had been Seattle district manager for the Flexible Shaft Co., leaving in August 1942 to join the War Production Board. His experience also includes 16 years in the electrical jobbing business at San Francisco and service as northwestern representative for Manning Bowman Co.

● CHARLES HESS has resigned his position as utilization manager for Puget Sound Power & Light Co. and has gone into business for himself as a partner in the Puget Sound Appliance Co., Seattle. Hess started with Puget Sound in 1924 as merchandise salesman. As chairman of the Northwest Electric Light & Power Assn.'s Utilization Section, he was active in promotion of the regional dealer sales meetings staged by the association last year.

● CHARLES WILDEBOUR, an employee of Puget Sound Power & Light Co. since 1925 and supervisor of the company's farm experimental laboratory since 1937, has resigned to go into business in Los Angeles. He will be a partner in a business dealing with physicians and clinical supplies. Wildebour had served the utility in its division offices. as sales manager at Everett before being named agricultural engineer in charge of the farm electrification and experimental laboratory at Puyallup.

Smith Denver District Manager for G-E Supply

Will O. Smith, Rocky Mountain district sales manager for General Electric Supply Corp., recently was promoted to general manager of the new Denver, Colo., district. E. E. Brazier, former Denver branch manager, begins the new year as manager of the Salt Lake district, where he was sales manager before his transfer to Denver.

Smith has been with General Electric Co. since 1919. He is past president of the Electrical League of Utah.

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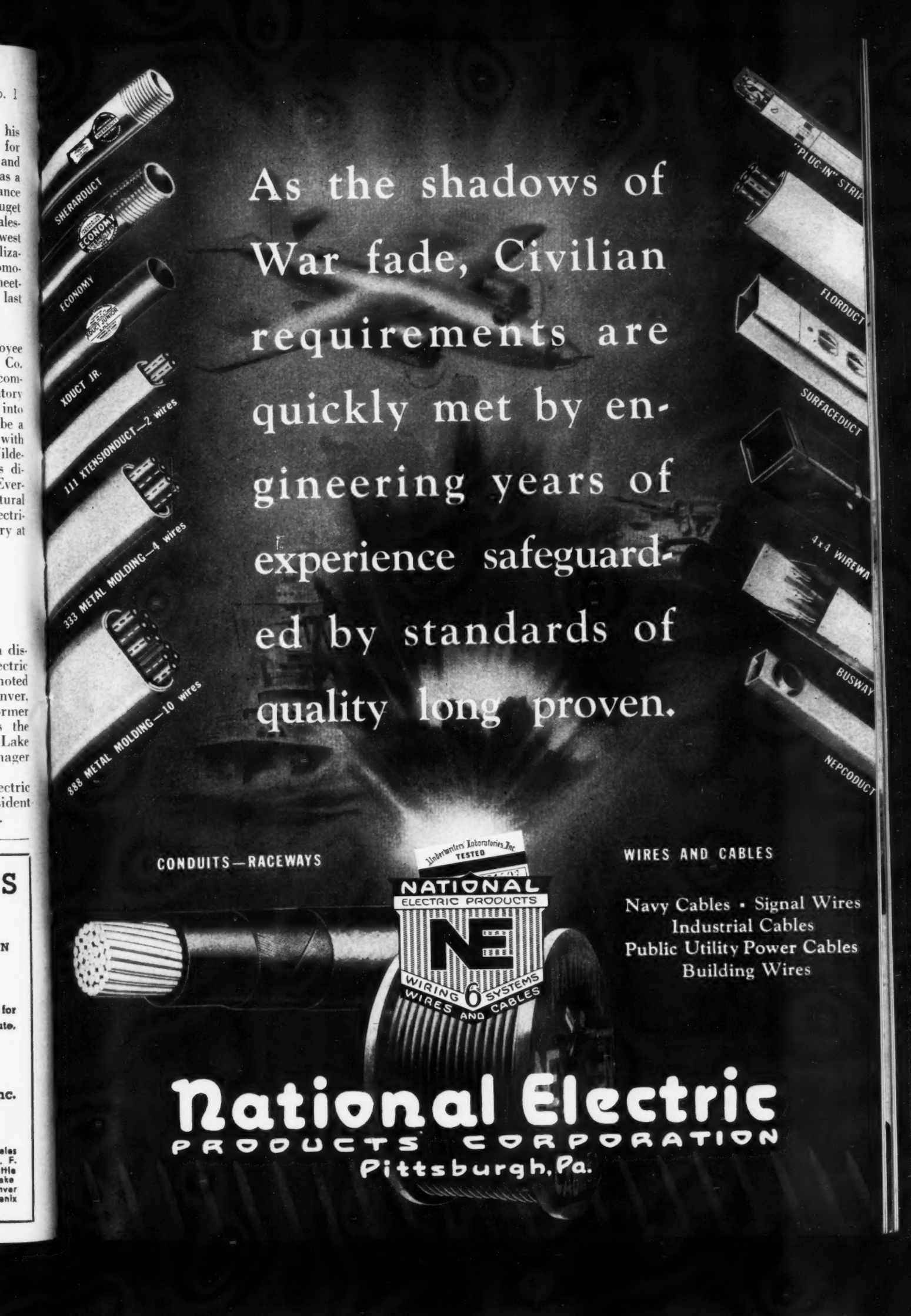
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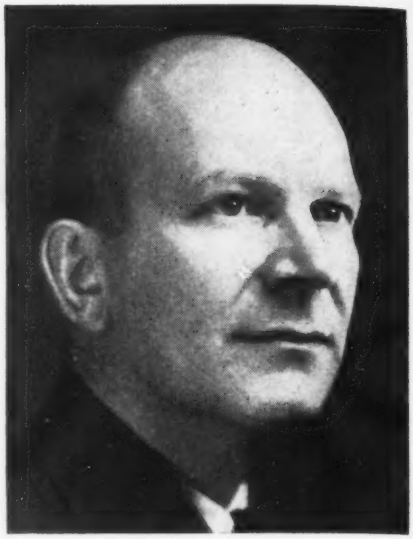
BUY MORE WAR BONDS

Seton New Treasurer for Portland General Electric

Waldemar Seton, Jr., who has been associated with Portland General Electric Co. in legal and managerial capacities for 17 years, has been appointed treasurer of the company to succeed Raymond E. Brennan, who resigned to become assistant to the president of the Pacific-Atlantic Steamship Co. in Portland. Seton's appointment was effective Dec. 1. He was born in Portland, graduated in law from the University of Oregon and joined the staff of the company in 1927. Announcement of the appointment was made by James H. Polhemus, president of the company, at a dinner for company executives and key men honoring Brennan, who had been treasurer and comptroller for more than 13 years.



Seton

● JOHN EVANS, who for 15 years has been in charge of art and displays for Utah Power & Light Co. at Salt Lake City, has opened offices at 1012 Continental Bank Building in that city. Evans won the sweepstakes award in the public utilities division at the 1939 convention of the International Association of Displaymen.

● ELBERT KRAMER, former southern California supervisor for Westinghouse Electric Appliance Division, has been appointed supervisor of the company's Better Homes Department on the Pacific Coast. From headquarters in Los Angeles, he will supervise activities in nine Western states, Alaska, Hawaii.

● J. L. GRAY has been made manager of purchases for the Southern California Edison Co., succeeding the late E. F. Watkins. Gray was assistant manager of purchases and has been with the Edison Co. since Oct. 14, 1903. He has been in the purchasing department about 35 years.

● CONRAD PEARSON has been elected president of the Pend Oreille (Wash.) Electric Cooperative. P. D. Unruh was named vice-president, L. C. Peterson, secretary, and Reuben McKim, treasurer.

● PROMOTION to the rank of lieutenant colonel of Major Frederick E. Anderson of the Sacramento, Calif., district, United States Army Engineers, and designer of the recently completed floating power plant, the barge *Electra*, was announced recently by Col. Robert C. Hunter, head of the Sacramento district. Organizer in 1922 of the F. E. Anderson Co. which dealt with design and installation of electrical irrigation systems, Col. Anderson joined the civilian staff of the Sacramento district in 1926 as head of electrical engineering and design.

Jollyman Retires from Pacific Gas and Electric

J. P. Jollyman, chief of the division of hydroelectric and transmission engineering of Pacific Gas and Electric Co., retired from active duty Jan. 1, under the company's retirement income plan. "Joe," as he is known to scores of co-workers and associates, ranks as a national authority on hydroelectric design and high-voltage transmission, having pioneered in many practices now commonplace.

He was the first to design and build a transmission line for operation at 220,000 volts, having placed in operation the original Pit River lines in November 1923. Under his direction were solved the many perplexing problems of corona, stability, relaying and carrier communication on 220-kv. lines.

After being graduated from Stanford University in electrical engineering in June, 1903, he entered the employ of the California Gas and Electric Corp., one of the properties later merged into the present PG and E system. He served in various capacities in building of hydro plants and substations until 1909, when he joined Great Western Power Co. In 1911, he returned to PG and E as engineer of electric construction and in 1920 was given the title which he held at the time of his retirement. For 33 years he has been responsible for design of all hydroelectric plants and transmission lines built by PG and E. Although retired from active duty, his services will be retained in an advisory capacity.

You'll want this Oven in your KITCHEN

MODEL HO 502BR

Roasting Section: Inside Dimensions 13" x 30" x 37¼"
Baking Section: Inside Dimensions 9" x 30" x 37¼"
Accessible Vent Control Lever
Heating Units Separately Controlled
Automatic Adjustable Thermostat—200° to 550°
Control Switches Recessed
Full Width, Shelf-type Door
Control Panel Hinged for Easy Service
3½" Insulation in Top, Bottom, Back, Sides
Sections Operate Independent of Each Other

More space for baking or roasting. One, two, or three sections high—nine possible combinations. This is the giant of Electromaster's line of heavy duty electric cooking equipment.

Electromaster offers durable, efficient ranges and ovens for clean, speedy cooking—easy to install, easily serviced—priced sensibly because of Electromaster's exclusive straight line production methods.

The big Electromaster catalog contains 8½" x 11" blueprints of this and other Electromaster heavy duty ovens and ranges. Illustrated throughout, it includes complete specifications and descriptions of each model plus important factual data on Electromaster equipment and accessories. For wartime buying or peacetime planning, this handsome file-size book will help you. Your free copy will be sent immediately. Mail the coupon today!

Electromaster

ELECTROMASTER, INC.
Detroit 31, Michigan

Send at once, without obligation, your big, file-size catalog of heavy duty electric cooking equipment containing complete specifications and full-page blueprints.

NAME_____

TITLE_____

Attach this convenient coupon to your letterhead.

California Commission Makes Personnel Shifts

Creation of separate gas and electric divisions of the California Railroad Commission's public utilities department and resulting personnel changes were announced recently by E. F. McNaughton, director of the department.

In the new set-up, Roy A. Wehe, assistant director of the department, will have charge of coordination of the two divisions, in addition to his responsibility for planning and conduct of major formal and informal rate investigations.

Robert P. O'Brien has been appointed electrical engineer in charge of the electric division and Lloyd E. Cooper will head the gas division. O'Brien has been with the commission since December 1938 and has been engaged in general regulatory investigation dealing with valuation, rate base and depreciation.

C. T. Mess, with change in title to chief of the division of valuation, will continue to have charge of inventory and appraisals, accrued depreciation and rate base determinations. Charles T. Mors has been named research engineer, succeeding Walter B. Wessells, who had been doing the work temporarily in addition to other duties.

Deaths

Herbert S. Sands

Herbert S. Sands, 70, one of the Rocky Mountain West's most noted electrical engineers, died Dec. 12 in Oklahoma City. Active until stricken with a heart attack, he had gone from Denver, his home, to Oklahoma City for a meeting of the regional federal home loan bank board of directors.

Mr. Sands' accomplishments and services to his profession and the public date from his arrival at Cripple Creek, Colo., in 1898 to straighten out operating difficulties on the electric interurban railroad connecting Cripple Creek and nearby Victor during gold rush days. To do this work, he left a position as superintendent of operation for a Connecticut power concern. Moving to Idaho Springs, Colo., in 1901, Mr. Sands became construction and operations engineer for the local electric generating company (now a part of Public Service Co. of Colorado) and came to Denver in 1905 to become regional industrial manager for Westinghouse Electric and Mfg. Co. He retained this connection until 1927, installing electrical equipment in many famous Colorado mines and other Western industrial plants.

For the past 17 years, Mr. Sands had conducted his own business as a consulting engineer. In this capacity he was so highly regarded that his surveys and recommendations were frequently acceptable to all parties concerned in rate and other kindred disputes.

He was a member of the board of directors of Public Service Co. of Colorado and was active in the Rocky Mountain Electrical League. He aided in the consolidation of the present RMEL from uncoordinated groups in several Western states.

At the age of 15 he received an appointment to the Edison General Electric Co. in Schenectady, where he laid the foundation for his technical knowledge. In 1926 he was awarded an honorary degree in electrical engineering by the University of Colorado. For years he was listed in *Who's Who in America*.

Paul M. Downing

Closing a long and illustrious career in the electric utility business, P. M. Downing, executive vice-president of Pacific Gas and Electric Co. died Dec. 11 at St. Luke's Hospital in San Francisco. Although he had been in ill health for two years, he had held to his daily schedule at the office, until his doctors insisted that he go to the hospital for treatment.

Paul Milton Downing, known affectionately to his associates as "P.M.", was born at Newark, Missouri in 1873. He entered Stanford University on the day that it first opened in 1891 to major in electrical engineering. His first job after graduation was as dynamo tender in the generating plant of the Tacoma, Wash., Light and Power Co., but he soon returned to California, where he worked for the Market Street Railway before joining the Blue Lakes Water Co., a predecessor of PG and E, in 1897.

P. M. Downing

During his service at the Blue Lakes power house, he became acquainted with John Martin, who was to play an important role in expansion of the industry in northern California. Mr. Martin and his associates formed the Bay Counties Power Co. and later merged it into the California Gas and Electric Corp. Mr. Downing was appointed San Francisco division superintendent of the Bay Counties company in 1901, and two years later was made superintendent of substations and operating engineer for the California Gas and Electric Corp., directing the operation of eleven hydro power houses.

When, in 1905, Pacific Gas and Electric Co. was incorporated by merger of the California Gas and Electric Corp., and the San Francisco Gas and Electric Co., Mr. Downing continued as superintendent of substations and operating engineer until 1908, when he was appointed engineer of operations and maintenance. In 1917, he was named chief engineer and, in 1920, vice-president in charge of electrical operations. Subsequently, his duties were enlarged and he was made vice-president in charge of electrical construction and operations. In 1929, he was appointed first vice-president and general manager, a position which he held until August 1943, when he was made executive vice-president.

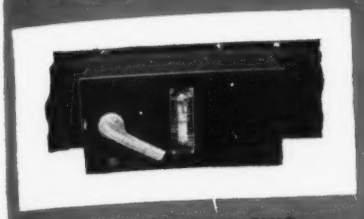
Mr. Downing's accomplishments in the field of electrical engineering were outstanding and he was credited with playing an important part in the development of many improvements in the utility industry. Among them were the world's first central load-dispatching system, the "grid" system of interconnection and long-distance transmission. He possessed tireless energy and practical knowledge of every job to be done.

Ross E. Phillips

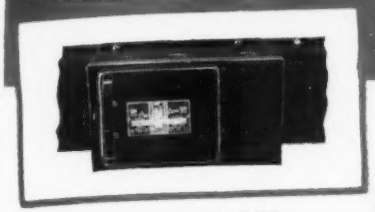
Ross E. Phillips, former treasurer and director of Public Service Co. of Colorado, died Dec. 14 in Denver, while funeral arrangements were being made for his friend and colleague Herbert Sands, who preceded him in death by less than one day.

Mr. Phillips, 58, was born in Table Rock, Nebr., and entered the electrical industry at Lincoln as bookkeeper for the Doherty-owned company there. This association with the late utility tycoon's interests was never broken. Mr. Phillips transferred from Lincoln to Amarillo, Texas, in 1923 and came to Denver two years later as director of the Doherty training school where, under his guidance, many of the nation's notable electrical, petroleum and gas engineers were developed.

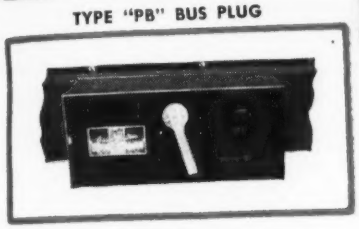
For every circuit protective purpose



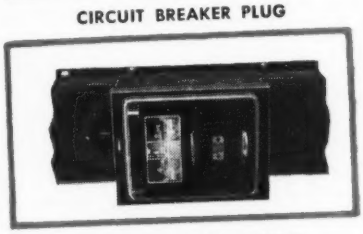
VACU-BREAK SWITCH PLUG



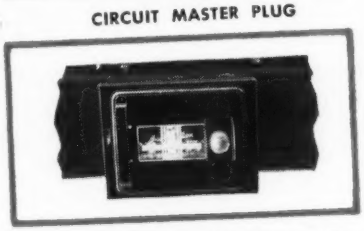
TYPE "PB" BUS PLUG



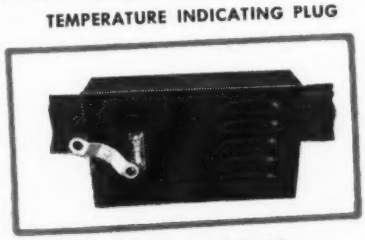
CIRCUIT BREAKER PLUG



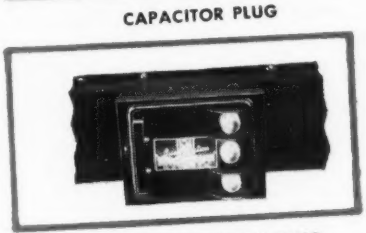
CIRCUIT MASTER PLUG



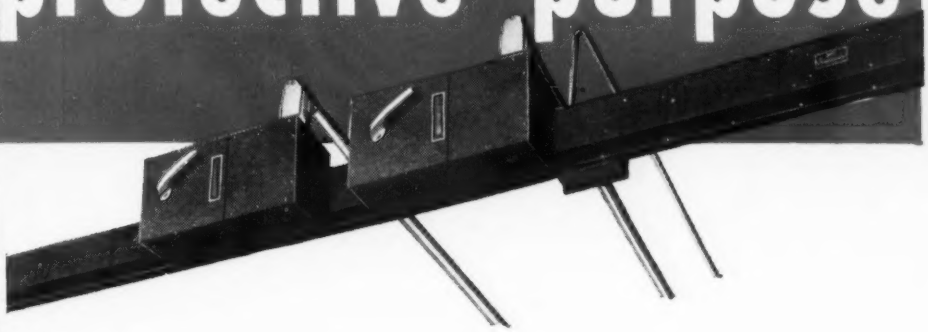
TEMPERATURE INDICATING PLUG



CAPACITOR PLUG



GROUND DETECTOR PLUG



BULLDOG BUStribution DUCT offers a plug *built for the job*

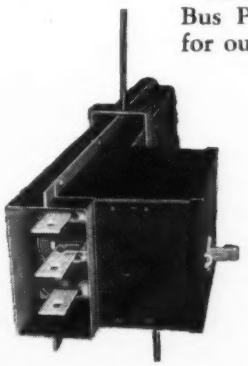
One of the outstanding advantages of the BullDog BUStribution DUCT system is the wide variety of circuit protective tap-off plugs available in standard pre-fabricated types.

Designed to improve the efficiency of the system through maximum flexibility and adaptability, the standard BullDog Bus Plugs provide a convenient means of current take-off that is completely interchangeable for type, volts, poles and sizes.

All Bus Plugs fasten securely to the flanges of the duct section at the plug-in openings, may be mounted on either or both sides of the duct and require no auxiliary screw clamps or fittings.

Plugs may be removed from duct and moved to a new location at a minimum of labor expense and with no material loss, permitting rapid rearrangement of production machinery to meet expansion programs, change-overs or new production methods.

For complete information on the various BullDog Bus Plugs illustrated in this advertisement, write for our illustrated bulletin 427-2.



PLUG MOUNTED ON DUCT
This end view of a plug mounted on duct shows how the copper "contact" fingers of the plug clamp over the bus bars in the duct.

Manufacturers of a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Breakers and BUStribution SYSTEMS.

BULLDOG
ELECTRIC PRODUCTS CO.
BOX 177, R. PK. ANNEX
DETROIT 32, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ont.

Field Engineering Offices in All Principal Cities

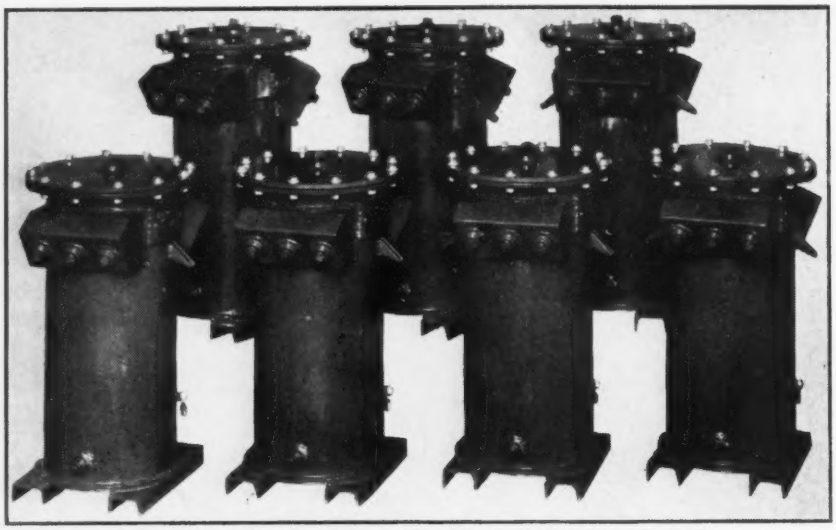
For a Bright Future Buy More War Bonds

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N.E. Sixth Avenue
Portland, Oregon, Tel. Garfield 2844

Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224



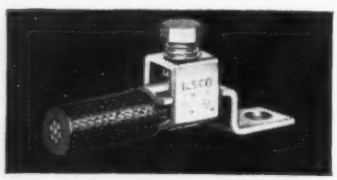
7—5 KVA Subway Type Transformers, 2400 Volts to 120/240 Volts, Single Phase. Wiping sleeves supplied but not shown in photograph.

Pictured above are efficient, sturdily-built GARDNER Subway Transformers recently supplied to one of the largest electric utilities on the Pacific Coast. Rugged in construction and absolutely water-tight, these transformers built by Gardner are competitively priced.
For further details write to—

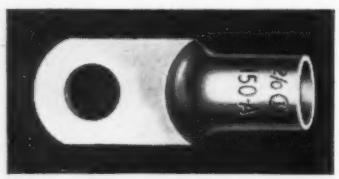
Gardner Electric Mfg. Co.
4227 Hollis St. Emeryville 8, Calif.

Represented by
MAYDWELL & HARTZELL
INCORPORATED
SAN FRANCISCO LOS ANGELES SEATTLE PORTLAND

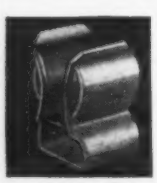
LINE UP WITH THE *ILSCO LINE FOR '45*



America's most complete and economical line . . . featuring standard and special items . . . ready to serve you.



ELECTRICAL CONNECTORS FABRICATED TUBE PARTS



Write for illustrated catalog.

Western Distributors
ELECTRICAL SPECIALTY COMPANY
Seattle—San Francisco
STRIEBY & BARTON, Ltd.
Los Angeles

ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

ELECTRICAL ENGINEER WANTED

"The Public Utilities Board of the City of Alameda, California, is desirous of obtaining the services of a graduate electrical engineer. The City of Alameda, through its Public Utilities Board, operates its municipal light and power sub-stations and distribution system. Anyone interested in this position should address a communication to J. C. Spencer, General Manager, Department of Public Utilities, City of Alameda, giving detail of education, qualifications, experience and salary expected."

POSITION OPEN

Sales Engineer with electrical engineering training, between 25 and 40 years of age. ESSENTIAL ACTIVITY. PERMANENT. San Francisco Bay Area. Reply, Box 10, Electrical West.

TRADE *notes*

Reporters Tour Westinghouse Plant at Emeryville, Calif.

Its facilities enlarged to meet war demands both for new and for repairs to military equipment, the Westinghouse Electric & Mfg. Co. took a large group of editors and newspaper writers through its Emeryville, Calif., plant Dec. 5, in order that they might convey to the public, denied admission during the war, the extent of enlarged facilities and changes in production line methods. At the same time Charles A. Butcher, Pacific Coast district manager of the manufacturing and repair department, announced increases in the repair facilities in the Seattle, Portland and Los Angeles plants at an overall cost of $1,000,000.

It was explained that there will be no reconversion problem involved to change to civilian production when permitted. The Emeryville plant, with new straight line production facilities for transformers, motors and panelboards, is designed to assemble on demand any special windings or characteristics in motors or transformers demanded in the West from basic parts kept in stock. The motor plant, for instance, is a winding and assembly plant, the basic frames, rotors, etc. coming from Eastern factories.

Repair facilities have been increased five-fold to give speedy rebuilding service to battle damaged Navy and Army electrical equipment. The refrigerator repair shop, once one of Emeryville plant's main departments, has been closed down for the duration. Manpower from it has been shifted into war-vital repair work.

Seeping through the impressions of the plant was a constantly recurring one that Charles Butcher, in the year since he took over, has made many improvements and efficiencies. Although buildings have been enlarged by 44,000 sq. ft., he is credited with greatly increasing production from previous floor space by streamlining of production methods. Capacity of the plant is credited with 100% increase because of these changes. A new department for making steam-driven turbine blowers has also been added.

Portland plant facilities have been increased from 7,500 to 18,450 sq. ft. and new tools and facilities added, quadrupling repair capacity. At Los Angeles new space has been acquired and the shops rearranged for straight line production.

At the luncheon for the editors

Section of the motor assembly department in the Emeryville plant. At left of the benches, grinders and other small tools are used for finishing small castings and to grind cores. In background is test and paint spray booth

Charles Dostal, vice-president of Westinghouse for the West, declared his company to be a full fledged Western manufacturing plant, vitally interested in developing the industrial future of the region.

Trumbull Electric Names New Officers, Directors

Both Trumbull Electric Mfg. Co., Inc., a California corporation, of San Francisco, and Trumbull Electric Mfg. Co.—Pacific division, of Seattle and Los Angeles, have new officers and directors, effective Jan. 1, as a result of the retirement of John H. Trumbull, president; Frank T. Wheeler, vice-president; Henry Trumbull, treasurer; and Stanley S. Gwillim, secretary and general manager, executive officials of the company at Plainville, Conn., the parent concern.

The California company, of which Lester Siebert is president, had on its directorate John Trumbull and Stanley Gwillim, in addition to Charles Barkus and R. M. Alvord. The new president of Trumbull, Elmer T. Carlson, and new secretary and treasurer, H. A. Papenfoth, will be on the board in their stead.

Officers of the Pacific division will be the national officers, succeeding John Trumbull, who has been its president; F. T. Wheeler its vice-president, Henry Trumbull its treasurer and Stanley Gwillim, assistant treasurer. William Froude is secretary and Carroll Hepler is vice-president and general manager of the Pacific division. The company is a General Electric owned organization, operating independently under its own management. John Trumbull, founder of the company in 1899, has been nationally prominent both in the industry and as governor of Connecticut.

● ANNOUNCEMENT of a change in name to Utility Appliance Corp. was made Jan. 1 by the Utility Fan Corp. Starting in 1925 as a manufacturer of ventilating equipment, the organization now produces air cooling, air moving and gas-fired heating appliances.

WESTERN REPRESENTATIVES
FRED W. CARLSON, Seattle
J. G. CORRIN, Los Angeles
R. F. HAMILTON, Denver
METER SERVICE CO., Salt Lake City

SWITCHES, ENCLOSURES, ACCESSORIES
METER DEVICES COMPANY CANTON, O.

GRAPHITAR
(CARBON-GRAPHITE)

THE IDEAL MATERIAL FOR
SEALS — BEARINGS — VALVE SEALS — BLADES — AND A SCORE OF OTHER USES.

Graphitar is a *non-metallic* product which resists chemical attack. It has self-lubricating properties and a low coefficient of friction. Graphitar is mechanically strong, yet extremely light in weight—approaching that of magnesium. Graphite will not warp and shows practically no expansion or contraction with extreme changes in temperature.

Manufactured in several basic grades, Graphitar may be further processed to add special characteristics as desired.

If you need a material that will not be affected by chemicals or heat, that will not corrode or score or seize, Graphitar will solve your problem.

For special applications, a letter or sketch outlining your problem, addressed to our engineering department, will receive prompt attention.

MARWOOD LIMITED
Exclusive Pacific Coast Agents for United States Graphite Company
SEATTLE · PORTLAND · SAN FRANCISCO · LOS ANGELES

H. H. Van Luven

307 East 3rd St. Los Angeles (13)
MUtual 5173

Manufacturers' Representative

CANNON ELECTRIC—DEVELOPMENT CO.
Hospital Signal Systems
Motor Plugs—Receptacles
Cable-Wire Terminals

LENZ ELECTRIC MFG. CO.
Lead—Braid Covered Cables and Wires
Tinsel and Copper Cordage
Special Cables

SIGNAL ENGINEERING & MFG. CO.
Relays—Bells—Horns—Code Call Systems
Fire Alarm Systems

HART MANUFACTURING COMPANY
Remote Control Equipment—
Relays—Thermostats

STERLING SIREN CO.
Electric Sirens

THE PAINE COMPANY
Toggle Bolts—Expansion Anchors

TRICO FUSE MFG. CO.
Fuses, Offers, Clip Locks and Fuse Pullers

KNOX PORCELAIN CORP.
Electrical Porcelain

RELIANCE TIME SWITCHES

10 to 50 Amp.
•
Single Pole
Double Pole
Two Circuit
Indoor and
Outdoor Types
•
Listed by Underwriters' Laboratories.

A complete line of automatic time switches for practically every installation. Highest quality construction with a record of dependable service for nearly 35 years. Specify Reliance Time Switches and be sure you are specifying the best. Catalog on request.

SOLD THROUGH WHOLESALERS
J. J. Perlmuth & Associates
942 Maple Avenue
Los Angeles 15, Calif.
Reliance Time Switch Service Co.
3055 Sacramento Street
San Francisco, Calif.
Harold M. Hudson Co.
807 Lowman Bldg.
Seattle, Wash.

RELIANCE
AUTOMATIC LIGHTING CO.
1929 Mead Street Racine, Wisconsin

Allis-Chalmers Makes Dealer Appointments

Allis-Chalmers Mfg. Co. has announced the following dealer appointments:

The George M. Philpott Co., San Francisco, will distribute texrope drives and allied products.

Marelco, Inc., San Francisco, has been named electric motor dealer.

Atlas Engineering Co., Oakland, has been appointed as dealer in centrifugal pumps, texrope drives and allied products.

● A MOTOR REPAIR business, Johnson Electric Service Co., has been opened at Ogden, Utah, by Harold and Elmer Johnson. The former was for seven years a journeyman lineman for Utah Power & Light Co. Initially the shop will limit its work to repair of small appliances and single-phase motors but eventually, it is planned to sell and service all types of electrical appliances. At present much of the business comes to the shop from army installations in the area, Harold Johnson reports.

● CROSLEY CORP. has appointed the Arizona Appliance Mart as its distributor in the state. The Arizona concern has been operating since 1939 and has two offices and distributing points, one at 312 E. Congress St., Tucson and the other at 440 W. Washington St., Phoenix. G. A. Larriva is manager.

Bethlehem Steel Co. has announced acquisition of the Pacific Coast Forge Co. of Seattle, makers of threaded products. The plant is adjacent to Bethlehem's Seattle steel plant. Bethlehem also owns bolt and nut plants adjacent to its south San Francisco and Los Angeles plants.

● MCLENNAN, MCFEELY & PRIOR, LTD. has taken over the hardware, furniture, sports goods and electrical business, which has been operated for the past 20 years by J. S. Daly at Abbotsford, B. C. Daly will continue with the business as manager.

● MOTT ELECTRIC, 720 Front St., New Westminster, B. C., has purchased tax sale property near Agnes and Columbia Sts., and is reported to have received approval of plans to erect a warehouse, display room and office block.

● GEORGE CAMERON and DONALD WILDE have withdrawn from partnership in the Modern Electric Co., Vancouver, B. C. A. Gustin is continuing the business.

SAVE NOW...fight inflation...

..and these are things worth saving for!

SAVE FOR CHILDREN! It costs money to have a child, to raise a child. But where's the father or mother who would tell you it isn't worth every penny it costs and more? Save now... while the money's coming in....save to have and enjoy your children while you're young!

SAVE FOR COLLEGE! If you went to college yourself, you want your children to go, too. If you didn't—that's a double reason you want them to have the good life you missed. Start your college fund now—while you're earning good money. It will come in handy.

SAVE FOR A HOME! A house of your own, a garden to dig in, room-to-grow for the children—every man and his wife want that. Houses are high-priced, hard to get, now. But there'll be a lot of home building after the war. Save for *your* house now.

SAVE FOR A TRIP! Today's no time to travel. But after the war—aren't you rarin' to go? To the ocean or the mountains, to Yellowstone or the Smokies, to Mexico or the new Alaska highway. Sensible saving today can finance glorious spending then.

SAVE TO RETIRE! Sooner than you think, the day will come when a little shack in Florida or a place in the country looks better to you than an active life in town. Social security is good—but it won't pay for all you want unless you supplement it.

SAVE FOR SAFETY! Money's easy today! But evreybody can remember that it wasn't always that way—and it may not be again. The man who has a little money laid by, helps prevent depression—is in better shape to ride out hard times if they come.

SAVE TO SAVE AMERICA! It's the money you *don't* spend that helps keep prices down. And only by keeping prices down—saving, not spending—can we head off inflation, keep America a stable, happy place for our boys. For *your* sake, for *theirs*—SAVE!

4 THINGS TO DO to keep prices down and help avoid another depression

1. Buy only what you really need.
2. When you buy, pay no more than ceiling prices. Pay your ration points in full.
3. Keep your *own* prices down. Don't take advantage of war conditions to ask for more—for your labor, your services, or the goods you sell.
4. *Save.* Buy and hold all the War Bonds you can afford—to help pay for the war and insure your future. Keep up your insurance.

HELP US KEEP PRICES DOWN

A United States War Message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America

TRICO

KLIPLOK CLAMPS FOR FUSE CLIPS

SAVE FUSES—CLIPS—POWER

Note how that jack-screw pressure literally bolts the fuse and clip together!

KLIPLOKS ELIMINATE:

- Destroying temperatures
- Burnt fuses and clips
- Arcing at contacts
- Wasted current
- Unnecessary shutdowns
- Night and holiday repairs

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● C. W. McDaniel has severed his connection with the Fostoria Pressed Steel Corp. to join NewMac Co., Ltd., San Francisco manufacturers and distributors. In his new position, he will direct public relations activities throughout the eleven Western States, Alaska, Pacific Islands and the Orient. McDaniel became associated with Fostoria in 1935 and at the time of his resignation was director, vice-president in charge of sales, and secretary. He has at various times in his career served Aluminum Industries, Inc., Goodyear Tire & Rubber Co. and has headed his own sales and advertising counsel organization. He is general chairman of the International Lighting Exposition to be held in Chicago in April 1945. McDaniel is well known to the electric and automotive industries and has taken an active part in the work of the NEMA, IES, NAM, American Marketing Assn. and others.

● D. E. Sanford Co., Los Angeles manufacturer's representative, has announced a national expansion program, with sales offices in the East and Middle West supplementing its four West Coast offices. The Pacific Coast offices at Los Angeles, San Francisco, Portland and Seattle will continue under the personal supervision of David E. and Fred R. Sanford. New lines recently taken by the company on a national basis are the Waring Blenders, Aluron steam irons and Durabilt irons.

● Lynch & Scott, electrical contractors of San Francisco, planned to separate into two firms the first of the year. Edward J. Lynch will conduct Lynch Electric Co. at 973 McAllister St.; Edward W. Scott, the Scott Electric Co., at 2886 16th St. Scott is secretary of the San Francisco Electrical Contractors Assn.

● Magnet Electric Mfg. Co. has been incorporated with offices at its own address, 1835 Powell St., Vancouver, B. C. The company has $25,000 capitalization, and will engage in business as manufacturers and distributors of electrical appliances and equipment.

● Francis William Harcourt has registered his partnership in the business of the Standard Electric at New Westminster, B. C.

● Phelps Dodge, Los Angeles Tube Division, has been awarded another gold star, the third, for the plant's "M" pennant.

● Hugh N. Barclay has opened a radio and electric service store at 219 Lonsdale Ave., North Vancouver, B. C.

● ADAM BELL has established the Bell Electric at 136 Wallace St., Nanaimo, B. C. Bell served his apprenticeship as an electrician with the Hammond Cedar Mills, then engaged in electrical contracting work in West Vancouver. He later became foreman in the electrical division of Burrard Shipyards at Vancouver and has a total of 19 years' experience in the electrical field. Bell Electric will handle electrical contracting and repair work and electrical maintenance and motor rewinding.

● FOR THE SECOND time in three months, Ricketts-Sewell Electric Co., Ltd., Vancouver, B. C. has announced expansion of its business. Latest move, announced by L. G. Sewell, managing director, is acquisition of the business of the Coast Electric Repair Co. Last summer, the company took over the Electric Service Co. E. N. Marlatt, former head of Coast Electric, has joined Ricketts-Sewell as a partner. New offices of the firm are at 542 Howe St.

● GIDDENS ELECTRIC LTD. has joined the ranks of Kamloops, B. C., firms in the field of electrical contracting and retail sales of all types of electrical appliances. In the firm are J. H. Giddens, president; Dennis Giddens and S. J. Humphrey. M. G. Hall is manager. Hall had been in the electrical business previously as a partner in Hall & Young.

● WESTINGHOUSE RADIO STATIONS Inc. took over operation of Radio station KEX in Portland on Dec. 28. J. B. Conley, former manager of Westinghouse stations at Fort Wayne, Ind., will be general manager of the Portland station. Station KEX formerly was owned by the *Oregonian*.

● FRED C. WOOD CO. has been appointed West Coast representative for Waverly Tool Co., of Irvington, N. J., manufacturing Steam-O-Matic irons and Peti Point irons. His offices are in the Western Merchandise Mart, San Francisco.

● APPOINTMENT of Joseph E. Vaughan as its distributor in western Texas and most of the state of New Mexico has been announced by Crosley Corp. Vaughan's headquarters are at 821 N. Mesa, El Paso, Texas.

● ELECTRIC WHOLESALE MART of Los Angeles has been appointed distributor for Duchess Washing Machines, product of the Appliance Mfg. Co., Alliance, Ohio.

● CHARLES DUNN has opened an electrical repair shop at 1506 W. Fourth Ave., Vancouver, B. C.

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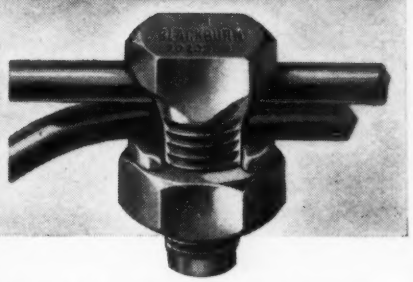

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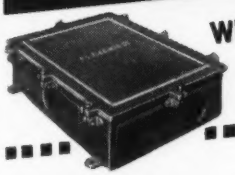

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PROFILES *of the month*

Left: A. D. Smith retired recently from Utah Power & Light Co. after 42 years as purchasing agent. He is with W. C. Allen (left), his successor. Below: Members of the Westinghouse staff at Emeryville who last month conducted a tour through the plant (P. 100). From left: Charles A. Butcher, Pacific Coast district manager, manufacturing and repair department, Grant Wiswell, Edmund S. Holt, J. J. Beitler, J. S. Hebrew, R. A. Gieseker, Tom H. Keppner, D. O. Poultney, R. L. Hubbert, Merle Bell, Eleanor Haas

Members of the Pacific Power & Light Co. line crew at Sunnyside, Wash. recently completed five years without a disabling injury or lost-time accident. Part of the 16-man crew is pictured below. From left, standing: James Richey, Herb Woods, Ronald Nelson, George Minnich, J C. Hamilton, district manager, James Davenport, crew foreman, Art Pursell, John Rogers. Front row: Cecil Hudlow line superintendent, Alfred Erz, head groundman. Six have been with the crew during the entire five-year period which the perfect record covers

LET'S ALL PULL TOGETHER
Surely, out of the experiences of this war, we've all learned to put a higher value on unity of purpose.
Without it, miracles of production could not have been accomplished . . . and the progress of mankind would be stalked by the spectre of "too little, too late."
Let us hope that out of the darkness of war will come the dawn of a better world in time of Peace. With freedom of action and unity of purpose, there can be no ceilings on progress if *we all pull together.*
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PACIFIC GAS AND ELECTRIC CO.

Electric Wiring can be "Misfit" too!

Modern electrical living is possible only in the properly wired home. Adequate wiring permits the fullest use of every electrical appliance . . . "misfit" wiring limits it. Adequate wiring provides for the addition of new electrical living conveniences . . . "misfit" wiring prevents it. Adequate wiring helps protect the owner against the early obsolescence of his home . . . "misfit" wiring hastens it. It is to the interest of everyone connected with the electrical industry—appliance dealers, manufacturers, architects and building contractors, power companies—to know the facts about adequate wiring.

PACIFIC COAST ELECTRICAL ASSOCIATION

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